

DOI Motorboat Operator Certification Course



This course has been modified by Nautical Know How, Inc. to meet the specific needs of the US Department of Interior Fish and Wildlife Service's Motorboat Operators Certification Course

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DOI Motorboat Operator Certification Course

Introduction

The U. S. Department of Interior Fish & Wildlife Service has licensed the use of the content of this course for their motorboat operators certification program. This course is approved by the National Association of State Boating Law Administrators (NASBLA) and recognized by the United States Coast Guard. In addition to meeting the requirements for the US Department of Interior Fish and Wildlife Service's Motorboat Operators Certification most marine insurance companies, in all states, give discounts to boat owners who have successfully completed such a course.

This course covers basic boating safety concepts that you need to know if you intend to participate in on water activities whether as part of your employment or for recreational purposes.

Educational Objectives

The Department of Interior Motorboat Operator Certification Course (MOCC) is made available to educate and provide information in boating and boating safety to all motorboat operators within the Department. The objectives of the course are to:

- ! Provide attendees with specific skills and knowledge that will allow them to make an informed decision about their own safety, the safety of any crew member, as well as the safety of the vessel,
- ! Familiarize attendees with state-of-the-art watercraft safety equipment and other gear, through demonstration and actual use, and
- ! Allow attendees to demonstrate, through written examination and physical demonstration, that they have adequate grasp of motorboat handling techniques and knowledge to safely operate a motorboat in a normal work environment.

This course is designed to introduce a boat operator to legal and safe boating practices. It applies to all who use a boat, whether as skipper or crew. It is primarily designed to address the requirements of smaller vessels, although some mention of larger vessels does appear.

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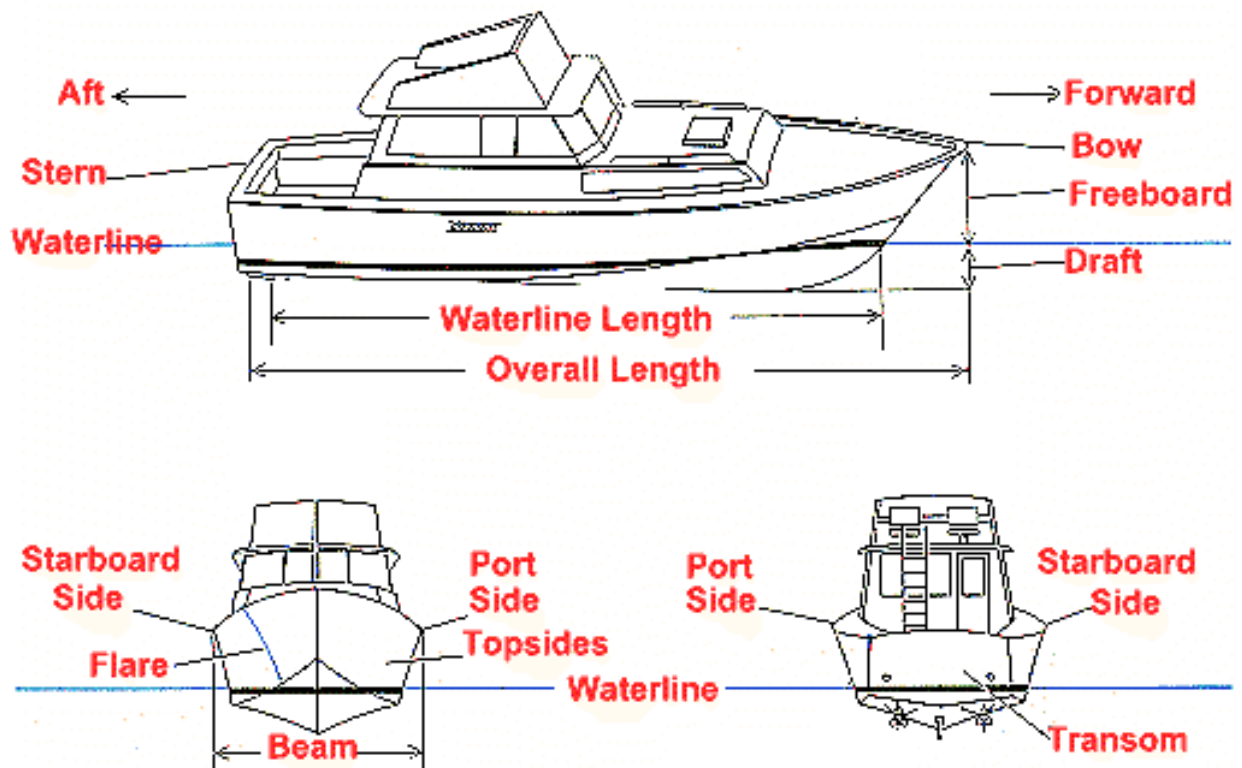
Chapter I- The Boat

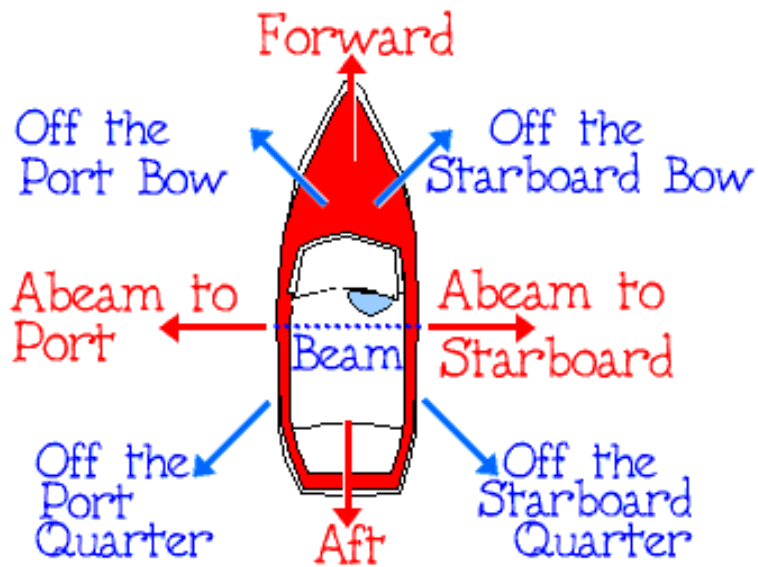


All across the country boating is growing each year. Companies and organizations use watercraft to monitor the environment, perform various job functions on the water, or monitoring the growing number of individuals and families discovering the fun and enjoyment that this recreational pastime brings. Until now, however, very little knowledge has been acquired prior to actually getting underway. Although boating as a recreation provides hours of enjoyment, it can also be very dangerous if the individual participants are not aware of the safety factors that must be considered. It is the intent of this curriculum to lay out the basics that must be considered in order to make your boating experience a pleasant one.

Terminology

Boating has a language all its own and just like any language which is foreign to our native tongue it requires practice and repetitious use to master. The parts of a boat are a good place to start. Each end and side of the boat has a special name. Its height and width also have special terms to describe them. For additional term definitions please see the glossary.



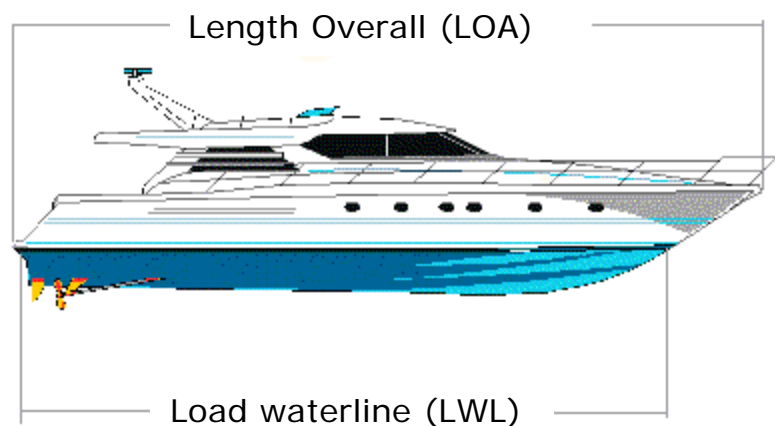


Boat Types

Choosing the right boat for the right purpose is the first step in operating a vessel safely. Just as you would not expect a small runabout to be able to cross the Atlantic, a large motor yacht would not be suitable to pull water skiers. Boats come in many sizes and configurations and each is designed with a particular use in mind. All boats that are propelled by propulsion machinery are considered motorboats.

How To Measure Length

A motorboat is measured along its centerline from the outside of the hull aft to the outside of the hull forward. This measurement does not include any attachments such as swim platforms, outboard motors, bowsprits, etc. This measurement is called the **length overall (LOA)**. You may also hear the term **length of waterline** or **load waterline (LWL)**. This is the length of the boat, parallel to its centerline, at the line where it meets the water.



Boat Classification

Boats can be classified according to their length, which is the horizontal distance from bow to stern along the centerline, excluding anything attached with clamps, screws or bolts. Boat classification determines the minimum legal requirements.



Class A (less than 16 feet) - Boats in this class are trailerable or are to be car-topped; including jon boats, personal watercraft, etc.; represents the greatest number of boats.

Class 1 (16 feet but less than 26 feet) - These boats can also be trailered; boats in this category are typically used for skiing, fishing, and day tripping; they may have enclosed cabins.



Class 2 (26 feet to less than 40 feet) - Large boats that usually include enclosed cabins with a lot of the conveniences of home.

Class 3 (40 feet to not more than 65 feet) - Large, expensive boats with advanced features and comforts.



Hull Designs And Uses

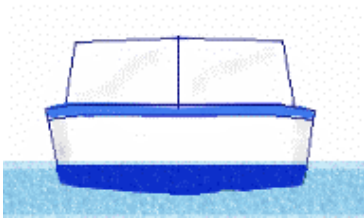
Boat designs encompass a vast range depending on the specific use for which the boat is planned. Boats are basically designed in two categories: displacement and planing.



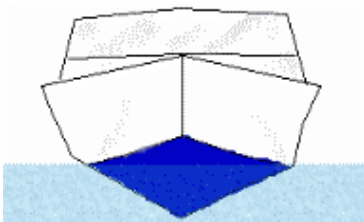
Displacement vessels are designed to move through the water with a minimum of propulsion. They will have a large underwater profile and will ride comfortably although slowly. These hulls have the greatest cargo holding capacity and when loaded properly, are also the safest. Trawlers and large sailing vessels are displacement vessels.

Planing vessels, however, are designed to actually rise up and ride on top of the water when power is applied. They require considerably more horsepower to get the boat up but they can attain much higher speeds from the reduced friction of moving on top of the water rather than through the water.

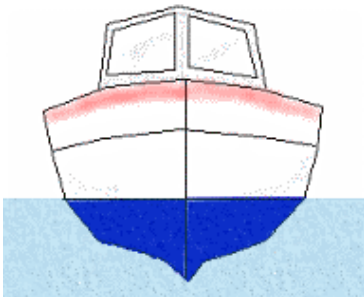
Types of Hulls



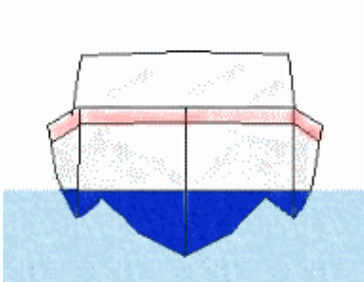
Flat bottom boat - These boats are generally less expensive to build and have a shallow draft. They can get up on plane easily but unless the water surface is perfectly calm they tend to give a rough ride because of the flat bottom pounding on each wave. They also tend to be less stable and require careful balancing of cargo and crew. Examples of flat bottom boats are Jon boats and some high-speed runabouts.



Vee bottom boat - The vee bottom tends to have a sharper entry into the water that provides for a smoother ride in rough water. They do, however, require more power to achieve the same speed as flat bottom or planing boats. Many runabouts use the vee-bottom design. They tend to be less stable than multi-hull boats.



Round bottom boat - These move easily through the water, especially at slow speeds. They do, however, tend to roll unless they are outfitted with a deep keel or stabilizers. Many trawlers, canoes and sailboats have round bottoms.



Multi-hull boat - Catamarans, trimarans, pontoon boats and some houseboats carry the multi-hull design. The wide stance provides greater stability. Each of the hulls may carry any of the above bottom designs.

Hull Materials

Aluminum- relatively lightweight, strong, can be inexpensive, many different hull types, highly durable, some types oxidize badly in salt water, repairs can be difficult and expensive, tends to be noisy and "sticks" to rocks.

Fiberglass- strong, relatively inexpensive, is subject to impact damage, e.g. nicks and scrapes whenever in contact with bottom, beach or other vessels, wide variety of hull designs, difficult to repair. Double fiberglass hulls offer a foam core and provide excellent floatation if damaged.

Steel- strong but heavy (makes for a slow boat), durable, expensive, not reasonable for motorboat construction in most applications.

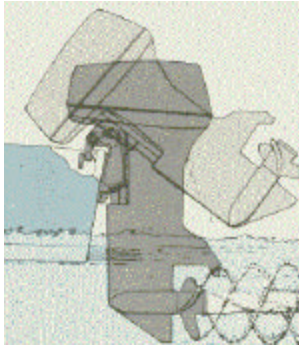
Inflatable- provides high degree of crew safety, reduces possible impact damage to vessel or injury to crew when working around other vessels or structures. Many styles can be portable; can be punctured but usually under severe conditions. Tend to be wet in heavy seas and wind. Highly durable and versatile family of vessels, relatively inexpensive. Available in "hybrid" designs utilizing various hard hulls in combination with inflatable tubes. Newer models offer closed cell foam in lieu of inflatable air chambers.

Wood- high construction cost, high maintenance, extremely costly repairs, limited styles, but quiet and warm.

Other- concrete, synthetic fibers.

Propulsion Requirements

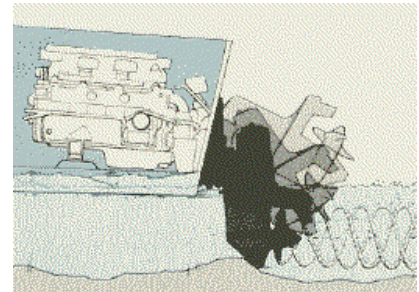
Each vessel, depending on its design and intended use, will require different types of propulsion. Most recreational vessels in the United States today use outboard engines and are less than twenty feet in length.



Outboard - Outboard motors are popular and quite useful on smaller boats. They are light and powerful and modern outboards are extremely quiet. The outboard provides a completely self-contained propulsion system from engine to transmission to shaft and propeller. They are most often mounted directly on the transom of the boat; however, you may find boat designs incorporating a motor well or bracket on which the motor mounts. The entire motor swivels about to provide easy steering as the turning propeller pushes the stern.

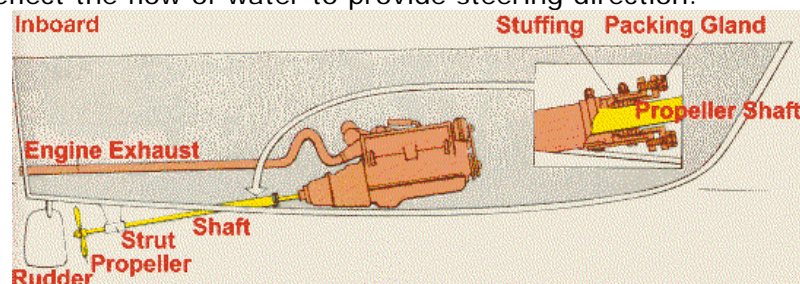
Outboards come in a large range of sizes and horsepower and can use different fuel sources. From small electric trolling motors to gasoline-and-oil-mixture two cycle engines to gasoline-only; four-cycle engines to diesel powered outboards, the selection is large.

Inboard/Outboard - These are also referred to as I/Os or stern drive engines. Stern drives are generally heavier than outboards. They consist of an engine mounted inboard and a lower unit attached low on the transom. This lower unit resembles the bottom part or lower unit of an outboard. The outdrive or lower unit part also swivels from side to side to provide for the steering of the boat. It can also be tilted up and down to provide boat trim while underway.

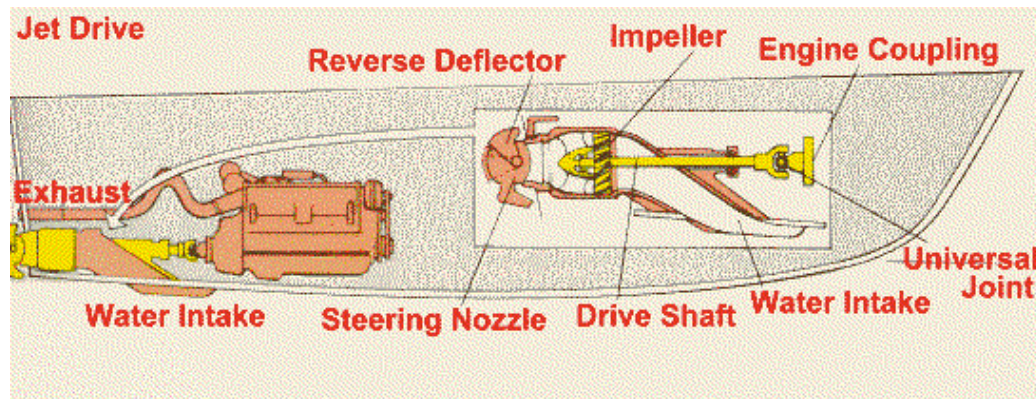


I/Os come in both gasoline and diesel models and larger ones generally have more power than outboards. Because the main power supply is similar to a small automobile engine, easily accessible and more powerful, stern drives are often favored over outboards especially on larger vessels.

Inboards - These engines are most popular on vessels over twenty-six feet in length. The engine, similar to the inboard/outboard, is mounted inside the vessel toward the center to give good weight distribution. The engine connects directly to a transmission out of which comes a shaft that goes through the hull of the boat as it passes through the "stuffing box". The shaft is then attached to a propeller that turns to propel the boat. (The stuffing box is a cylinder through which the shaft passes. The shaft is surrounded by a stuffing material which when compressed between the cylinder wall and the shaft prevents excessive water from entering the boat.) Since the shaft is fixed and does not swivel from side to side, a rudder is mounted behind the shaft and propeller to deflect the flow of water to provide steering direction.



Jet Drive - These propulsion systems have the advantage of having no propeller to cause potential danger to people in the water and marine life. They are now available in many power types in both inboard and outboard configuration that take in water that flows through a pump powered by an impeller. The water is then discharged at high pressure through a nozzle that propels the boat forward. The nozzle swivels to provide steering to the boat. Jet drive units require different control techniques at slow speed. When these techniques are mastered, a jet drive boat can have superior low speed handling. Most personal watercraft use jet drives.



Choosing the right type of propulsion system for your boat is a very important matter. Its weight and horsepower will both have an impact on the performance of your vessel. If your vessel is underpowered its engine will work hard continually and will provide poor performance. Additionally if your vessel is overpowered it may exceed the safe operating speed that was designed for the vessel.

Fuel Types

- Gasoline
- Diesel
- Electric

Gasoline Engine Types

- 4 Cycle- Straight gasoline has separate oil system for lubrication (usually inboard or I/O engines). These engines are generally heavier than 2-cycle engines but are usually quieter and less polluting. Use regular, automotive oil as required by engine manufacturer.
- 2 Cycle- Oil mixed with gas (most outboard engines), must be in proper proportions IE.50: 1 (50 parts gas to 1 part oil). Must use 2 Cycle Engine Oil. Some systems come with automatic oiler systems, such that oil is stored in separate tank and automatically injected into fuel mix as needed.

Propellers

- Diameter- the distance across the circle made by the blade tips as it rotates. Diameter is usually determined by the RPM at which the blade will be turning (usually larger diameter on slower boats, smaller on fast boats). As a rule, slower turning, larger diameter propellers are more efficient than faster, and smaller diameter ones.
- Pitch- is the distance that a propeller would travel forward through a soft solid, like a screw in wood. It is the product of Diameter and the Rake of the blades.

Note: This basic propeller information is stamped on the hub and consists of two numbers i.e. AaXbb where aa refers to the Diameter, and bb to the Pitch. Therefore a 13X10 prop is one with a 13" Diameter and a 10" Pitch, it should move the boat forward about 10 inches in one revolution of the propeller.

Propeller Materials:

- Plastic- cups inward when turning; easily damaged; low H.P. only; inexpensive.
- Aluminum- standard equipment, good strength and corrosion resistance, can chip or bend if it strikes an object, but this helps absorb impact and can save drive components.
- Stainless Steel- strongest material; effective blade type (thinner); less bend if it strikes object, transfers more force to drive components, needs additional protection in shallow water use; most expensive.
- Bronze- usually found on large craft, not on outboards (except some ski-boats).

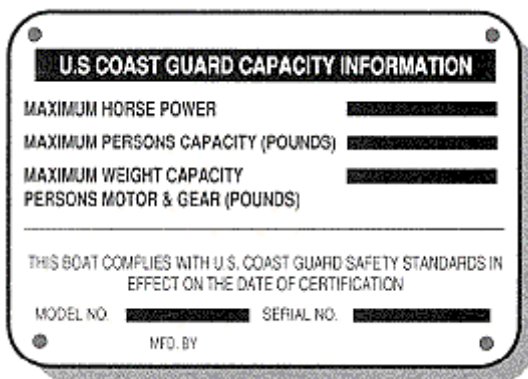
Propeller Selection:

Boat engine and propeller match-up is important for proper operation. The choice of a propeller is dependent on many factors including:

- Gross Weight of fully loaded boat (including boat, motor, fuel, passengers and equipment)
- Boat Length
- Hull Type
- Use of Boat

The process of selecting the correct prop involves finding the recommended wide-open throttle (WOT) RPM range for your motor in the owners manual. Select a prop using the charts supplied by the propeller manufacturer, taking into consideration all factors on the chart. After installing the prop, make several test runs to determine the maximum RPM and boat speed. If the WOT RPM is too high, install the next larger pitch prop and retest. If the WOT RPM is too low, install the next smaller pitch prop and retest. Most manufacturers carry a prop line such that the next pitch prop offered will change RPM by about 300-500.

Boat Capacity Plate



Boat builders must comply with Federal law by putting a Capacity Plate in sight of the helm (steering area) on motorized boats less than 20 feet in length. **This plate displays three important items:** (1) the maximum weight of persons on board in pounds, (2) the maximum carrying weight of the vessel in pounds and (3) the maximum horsepower recommended for the boat.

Should you own a boat that was built prior to the Federal law mandating capacity plates or have a homemade boat, the following formulas can be used

to determine safe loading capacity.

Formulas for Safe Loading			
Horsepower Capacity for small, flat-bottom boats. Multiply boat length (ft) times transom width (ft).		Person Capacity: Average weight per person is 150 lbs.	
If answer is:	Maximum HP is:	<div>Boat Length X <u>Boat Width</u> 15</div>	= Number of people
35 or less	3		
36-39	5		
40-42	7.5		
43-45	10		
46-52	15		
Note: For flat bottom, hard chine boats, with an answer of 52 or less, reduce one increment. (e.g. 5 to 3)		Boat length and width are measured in feet. Round fractions down to next lowest number.	

The limits shown on Capacity Plates assume good to moderate weather and sea conditions. It should also be noted that many manufacturers place capacity plates on boats not required to have them. This can be determined by the lack of the words U.S. Coast Guard on the plate.

Capacity Plate (outboards)- The plate must have the following information:

- Maximum person capacity in pounds.
- Maximum weight capacity (persons, motor and gear) in pounds.
- Maximum horsepower capacity.

Capacity Plate (inboards and stern drives)- The plate must have the following information:

- Maximum person capacity in pounds.
- Maximum weight capacity (persons and gear) in pounds.

Capacity Plate (manually propelled)- The plate must have the following information:

- Maximum person capacity in pounds.
- Maximum weight capacity (persons and gear) in pounds.

NOTE: In August 1980, the standard was changed requiring the display of person's capacity in number of persons as well as weight of persons.

Always check the capacity plate to make sure you are not overloading or overpowering the vessel. A motor larger than recommended will make the stern too heavy and can cause the boat to flip. The transom will ride too low in the water and could be swamped by your own wake or a passing boat's wake. Your boat will not sit properly in the water and will be difficult to handle.

Too many people and/or gear will also cause the boat to become unstable. Always balance the load so that your vessel maintains proper trim. Too much weight to one side or the other will cause the boat to list and increase the chance of taking on water. Too much weight in the bow causes the vessel to plow through the water and too much weight in the stern will create a large wake. All of these situations make the vessel difficult to handle and susceptible to swamping.

Remember that the capacity plate limits are suitable for normal operating conditions. In rough seas, bad weather or when operating in congested areas you will want to carry a lighter load.

Engine Systems

Cooling - Boat motors are not equipped with radiators as cars are, but still must somehow dissipate the heat generated by the friction of the moving parts. The two most popular cooling systems are the raw water system and the enclosed or fresh water-cooling system.

The raw water system simply takes water from the body surrounding the boat, pumps it through the engine to draw out the generated heat and discharges the heated water through the exhaust system. This discharge has two benefits. It cools the exhaust and also muffles the sound of the exhaust.

An enclosed system has the same general configuration as the raw water system. However, in the enclosed system a small tank containing anti-freeze is added to the engine and this "fresh" water-cools the engine parts. This liquid is then passed through a heat exchanger where its heat is dissipated through a series of tubes that are surrounded by the cooler raw water. This same raw water absorbs the heat of the fresh water and then is pumped out the exhaust as in the raw water system. The advantage of the fresh water or enclosed system is that the engine parts are not exposed to the surrounding potentially contaminated water. This is especially useful when operating in salt water.

Make sure when you initially start your vessel that water is being discharged from the exhaust system. This indicates that the cooling system is operational. **DO NOT START THE ENGINE WITHOUT WATER BEING SUPPLIED TO THE COOLING SYSTEM.** The impeller will

burn out very rapidly without water to cool and lubricate it and you risk the possibility of the engine seizing because of overheating.

Electrical - [The most common cause of boat breakdowns is electrical.](#) By the nature of what a boat does and how it does it, it is a floating corrosion pit. This is especially true when operating in salt water. You should keep all electrical systems clean and corrosion free by frequent inspection. Clean battery terminals, electrical connectors, etc. and spray them with a corrosion-retarding agent such as CRC or WD 40.

Fuel - Fuel systems are comprised of one or more tanks, valves, lines, pumps and filters. Each of these elements, if left un-serviced, can be potentially hazardous. Check your tank often for potential corrosion that could cause leakage. Inspect the shutoff valves, lines, and pumps periodically for corrosion or wear. Check and change filters frequently in order to be assured of clean fuel entering your engine. Use de-watering liquid additive in fuel tanks to ensure that water is not present.

[The most important tool you have to diagnose problems in the fuel system is your nose. Do the "sniff test" each time you board your vessel. If you smell fuel - find the problem.](#)

Oil and Filters - Just as it is important in your car to keep the oil and oil filters clean, the same holds true in your boat's engine. Every three hundred hours, or a least once each season, change the oil and filter on your marine engine.

Other tips - **Prepare a safety checklist as a reminder of items that may require service, maintenance or simply a periodic check. On the following pages you will find a generic checklist that can be modified for your particular vessel.**

Semi-Annual Safety Checklist

Personal Flotation Devices (PFDs)

In addition to your pre-departure inspection of PFDs check for wear or abrasion, weak or torn seams, secure straps and buckles. Some types of PFDs are equipped with inflation devices; check to be sure that cartridges are secure and charged.

Fire Extinguishers

- Do you have all required quantities and types of fire extinguishers?
- Have they been checked within the past year?
- Are serviceable units tagged by a licensed facility?
- Are units accessible?
- Is at least one accessible from the helm or cockpit?
- Are you and your crew familiar with their operation?

Fuel System

- Is the system properly grounded at the filter, tank, deck, pump, etc.?
- Is the fuel tank free from rust or contamination?
- No leaks from tank, hose or fittings.
- Hoses U.S.C.G. approved and free of cracking or stiffness with adequate slack to account for vibration.
- Is tank secured?
- Fuel shut-off valve on tank and at engine.
- Engine compartment and engine clean and free of oily rags or flammable materials.
- Blower switch at remote location.
- Is your fuel system protected from siphoning?
- Is the squeeze bulb in good and working condition?
- Is fuel filter less than one year old?

Safety Equipment

- Lifelines or rails in good condition.
- Stanchions or pulpit securely mounted.
- Hardware tight and sealed at deck.
- Grab rails secure and free of corrosion or snags that may catch your hands.
- Non-skid surfaces free from accumulated dirt or excess wear.
- Working flashlight and batteries.
- Flares (check expiration date)
- Emergency Kit (first aid kit, water, matches, etc.)
- Throwable Type IV PFD accessible.

Ground Tackle

- At least two anchors on board.
- Anchor and rode adequate for your boat and bottom conditions.
- Tackle properly secured.
- Length of chain at anchor.
- Thimble on rode and safety wired shackles.
- Chafing gear at chocks for extended stays or storm conditions.
- Anchor stowed for quick accessibility.

Stoves

- Labeled and designated for marine use.
- Properly ventilated to remove carbon monoxide from cabin.
- Retainers or rails for pots and pans while underway.
- If built-in, properly insulated and free from combustible materials, CNG and LPG (propane).
- Stored in separate compartment from vessel's interior and engine room.
- Tightly secured shut-off valve at tank.
- Proper labeling and cautions in place at tank location.
- Hoses, lines and fittings of approved and inspected type.
- Compartment is ventilated overboard and below level of tank base.

Electrical System

- Wiring approved for marine applications.
- Is system neatly bundled and secured.
- Protected against chafing and strain.
- Adequate flex between bulkhead and engine connections.
- Clear of exhaust system and bilge.
- System is protected by circuit breakers or fuses.
- Grounds to Zincs if required.
- Wire terminals and connections sealed to prevent corrosion.
- All electronics working.

Bilge Pumps

- Will pump(s) adequately remove water in emergency?
- Do you have a manual backup?
- Are bilges clean and free to circulate (clear limber holes)?
- Do you check bilges frequently and not rely on automatic pumps?

Corrosion Prevention

- Through-hulls, props, shafts, bearings, rudder fittings, and exposed fastenings free of Non-destructive corrosion.
- Zincs are adequate to provide protection; connections are tight and anti-corrosion compound applied.
- Through-hulls are properly bonded.

- Inspect the steering cables, engine control linkage and cables, engine mounts and gear case for corrosion.
- These items are properly lubricated or painted to prevent undue corrosion.

Through-hulls

- Are strainers, intakes and exhaust or discharge fittings are free from restrictions such as barnacles, marine growth or debris.
- Inspect sea valves for smooth operation.
- Handles are attached to valves for quick closure.
- Hoses are in good condition and free from cracking.
- Double hose-clamps below the waterline.
- Anti-siphon valve fitted to marine toilet.
- Through-hull plugs are near fittings or attached to hose in case of emergency.

Batteries

- Stored in non-corrosive, liquid tight ventilated containers.
- Non-conductive covers are fitted over posts.
- Batteries are well secured and fully charged.

Boat Hull

- Inspect hull for damage
- Ensure that fittings are tight
- Clean and lubricate hinges

Other

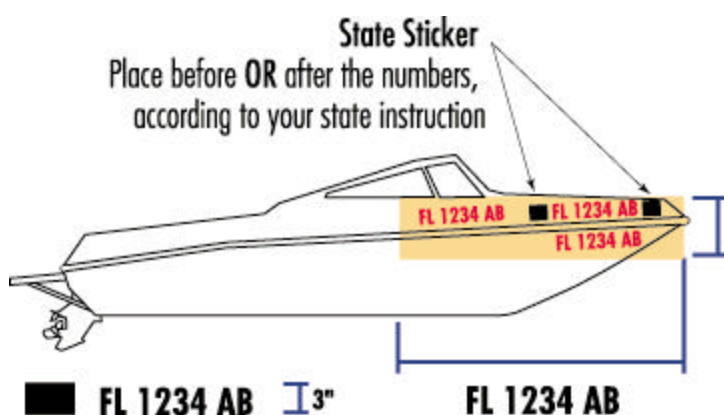
- Tool kit complete and free of corrosion (Socket set, pliers, wire cutters, screwdrivers, prop wrench, sparkplug wrench, crescent wrench)
- Spare parts onboard. (Sparkplugs, prop nut, grease, wire, fuses, duct tape, impeller and belts for I/O)
- Boat Cover and fasteners in good condition.
- Dock lines in good condition.
- Cleats secure and free of sharp edges.
- Adequate fenders onboard and in good condition.
- Boat hook onboard and in good condition.
- Knife sharp, free of corrosion and greased.
- Paddles onboard.
- Excess gear stored and/or properly secured.

Chapter II - Legal Requirements

Registration And Numbering

All motorized vessels must be registered and, depending upon State requirements, titled when operating on state waters. If a vessel does not have a motor it may still have to be registered depending on the State. Each state registration and titling requirements may differ. You should consult the State in which you are registering your boat for specific information.

Registering your boat means applying for and getting a certificate of number and the number itself. The registration number is actually a combination of letters and numbers normally beginning with the abbreviation of the State in which the boat is registered. The certificate of number is small and must be on the vessel whenever it is being used. A validation decal is required to be placed along side the numbers on the port side of the vessel. Some states require decals on both port and starboard side. This decal is renewed annually.



Letters must be plain block characters contrasting with the background and must be not less than 3 inches in height.

FL 1234 AB

Letters must be separated from numbers. Space between should equal the width of the widest letter.

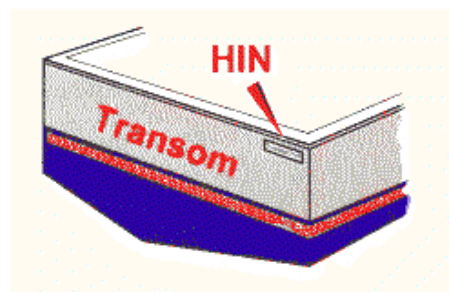
Proper display of boat numbers

- The figures are read from left to right.
- They must be displayed on the forward half of each side of the bow of the boat.
- Numbers must be in bold, block letters of good proportion.
- Numbers must be not less than three inches high.
- They must be of contrasting color to the boat hull or background.
- They must be as high above the waterline as practical.
- No number other than the number assigned can be displayed on the forward half of the vessel.
- Letters must be separated from numbers by spaces or hyphens.
- The validation decal must be displayed within six inches of the number.

Some vessels that are at least five net tons in size and owned by an American citizen can be registered with the U. S. Coast Guard. These vessels are "documented".

Hull Identification Number





Boats built since 1972 are required to have a Hull Identification Number (HIN) permanently attached to the transom on the starboard side above the waterline. This number is a serial number exclusive to your boat and is necessary to title and register it. You should record this number in a safe place. In case of theft it may help identify your boat.



In 1984 a new regulation was passed which requires the HIN number to also be permanently attached in a second unexposed location.

Required Equipment (minimum requirements)

All boats are required to carry certain equipment, determined by the length of the boat. Most items must be approved by the U. S. Coast Guard and kept in good condition and used only for their designated purpose. The following table lists Federal minimums; check your state regulations for any additional items required.

U. S. COAST GUARD MINIMUM REQUIREMENTS FOR RECREATIONAL VESSELS				
EQUIPMENT	Less than 16ft/4.9m	16 to less than 26 ft/7.9m	26 to less than 40 ft/12.2m	40 to not more than 65 ft/19.8m
Personal Flotation Devices (PFDs) 	One approved Type I, II, III or V (must be worn) PFD for each person on board or being towed on water skis, tubes, etc.	One approved Type I, II or III PFD for each person on board or being towed on water skis, etc., and one throwable Type IV device. (A type V PFD may be used in lieu of any wearable PFD, if approved for the activity in which the boat is being used. A TYPE V HYBRID MUST be worn to be legal.)		
	Check state laws for PFD wearing requirements for children and for certain watercraft and sports.			
Bell, Whistle 	Every vessel less than 39.4 ft (12 meters) in length must carry an efficient sound-producing device.	Every vessel 39.4 ft (12 meters) or larger in length must carry a whistle and a bell. The whistle must be audible for 1/2 nautical mile. The mouth of the bell must be at least 7.87 inches (200mm) in diameter.		
Visual Distress Signals (Coastal Waters, the Great Lakes & the high seas)	Required to carry approved visual distress signals for nighttime use.	Must carry approved visual distress signals for both daytime and nighttime use. 		
Fire Extinguisher (Must be Coast Guard approved) 	One B-I type approved hand portable fire extinguisher. (Not required on outboard motorboats less than 26 ft in length if the construction of the motorboat is such that it does not permit the entrapment of explosive or flammable gases or vapors and if fuel tanks are not permanently installed.)	Two B-I type OR one B-II type approved portable fire extinguishers.	Three B-I type OR one B-I type PLUS one B-II type approved portable fire extinguishers.	
When a fixed fire extinguishing system is installed in machinery spaces it will replace one B-I portable fire extinguisher.				
Ventilation (Boats built on or after 8/1/80)	At least two ventilation ducts capable of efficiently ventilating every closed compartment that contains a gasoline engine and/or tank, except those having permanently installed tanks which vent outside of the boat and which contain no unprotected electrical devices. Engine compartments containing a gasoline engine with a cranking motor are additionally required to contain power operated exhaust blowers that can be controlled from the instrument panel.			
Ventilation (Boats built before 8/1/80)	At least two ventilation ducts fitted with cowls (or their equivalent) for the purpose of efficiently and properly ventilating the bilges of every closed engine and fuel tank compartment using gasoline as fuel or other fuels having a flashpoint of 110 degrees or less. Applies to boats constructed or decked over after April 25, 1940.			

Back-fire Flame Arrestor	One approved device on each carburetor of all gasoline engines installed after April 25, 1940, except outboard motors.
Note: Some states have requirements in addition to the federal requirements. Check your state's boating laws for additional requirements.	

Personal Flotation Devices (PFDs)

PFDs are important potential life saving devices and are required onboard. Make sure when selecting a PFD that it is Coast Guard approved and is designed for a person of your size and weight.

PFDs must be Coast Guard approved, in good and serviceable condition, of appropriate size for the intended user, and the proper number/type. Wearable PFDs must be readily accessible, meaning you must be able to put them on in a reasonable amount of time in an emergency (vessel sinking, fire, etc.). They should not be stowed in plastic bags, in locked or closed compartments or have other gear stowed on top of them. Throwable devices must be immediately available for use. Though not required by federal law, a PFD should be worn at all times when the vessel is underway. A wearable PFD may save your life, but only if you wear it.

All boats must carry one Type I, II, III or V PFD (wearable) for each person aboard. For Type V PFDs to be counted they must be used according to their label requirements (and in most states be worn to be counted). Any boat 16 ft and longer (except canoes and kayaks) must also carry one Type IV (throwable) PFD.

The following is a list of types of PFDs and their intended use. One Type IV throwable device is also required on each vessel 16 feet or larger. Many states have regulations regarding the wearing of PFDs while underway. Check your state regulations.

DESCRIPTIVE TYPES OF PERSONAL FLotation DEVICES (PFDs)



Off Shore Life Jacket

A TYPE I PFD, or OFFSHORE LIFE JACKET provides the most buoyancy. It is effective for all waters, especially open, rough, or remote waters where rescue may be delayed. It is designed to turn most unconscious wearers in the water to a face-up position. The TYPE I comes in two sizes: Adult size provides at least 22 pounds of buoyancy, the child size, 11 pounds, minimum.



Near Shore Buoyant Vest

A TYPE II PFD, NEAR-SHORE BUOYANT VEST is intended for calm, inland water or where there is a good chance of quick rescue. This type will turn some unconscious wearers to a face-up position. The turning action is not as pronounced nor as effective as a TYPE I. An adult size provides at least 15.5 pounds buoyancy; a medium child size provides 11 pounds. Infant and small child sizes each provide at least 7 pounds buoyancy.



Floatation Aide

A TYPE III PFD, or FLOTATION AID is good for calm, inland water, or where there is a good chance of quick rescue. It is designed so that wearers can put themselves in a face-up position in the water. The wearer may have to tilt their head back to avoid turning face down. TYPE III has the same minimum buoyancy as a TYPE II PFD. Float coat, fishing vests, and vests designed for various water sports are examples.



Throwable Device

A TYPE IV PFD, or THROWABLE DEVICE is intended for calm, inland water with heavy boat traffic, where help is always present. It is designed to be thrown to a person in the water and grasped and held by the user until rescued. It is not designed to be worn. Type IV devices include buoyant cushions, ring buoys, and horseshoe buoys.



Type V Hybrid

A TYPE V PFD, or SPECIAL USE DEVICE is intended for specific activities and may be carried instead of another PFD only if used according to the approval condition on the label. Some Type V devices provide hypothermia protection. Varieties include deck suits, work vests, board sailing vests, and Hybrid PFDs. A TYPE V HYBRID INFLATABLE PFD is the least bulky. It contains a small amount of inherent buoyancy and an inflatable chamber and must be worn when underway to be acceptable.

Department of Interior policy requires that PFDs be worn at all times on vessels less than 26 feet in length. The PFDs must be international orange in color with reflective tape (485DM 22.4A(5), (6), (7). Currently, inflatable PFDs are not approved for use on DOI watercraft.

PFD Maintenance

- Do not alter PFD
- Do not kneel or sit on PFD, it will lose buoyancy
- Drip dry/air dry after use
- Store in well ventilated place, away from direct sunlight
- Do not expose to artificial heat source

Customizing Your PFD (recommended, not required)

- Whistle
- Strobe/marker light
- Signal Mirror
- Rescue/emergency knife
- Slings
- Carabiners
- Sunscreen
- Flare
- Space blanket
- Snacks in sealed bag

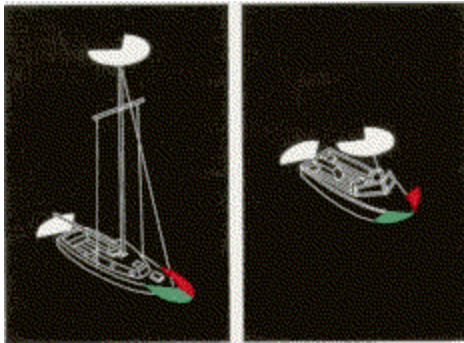
Navigation Lights

Specific lighting configurations are required for vessels operating between sunset and sunrise or in times of restricted visibility. Do not assume that your boat came from the factory or showroom with all the proper equipment. It's your responsibility to make sure your vessel shows the proper lights depending upon its size and the waters in which you are operating.

The U.S. Coast Guard Navigation Rules, International-Inland encompasses lighting requirements for every description of watercraft. The information provided here is intended for power-driven and sailing vessels less than 20 meters. The various options are illustrated.

The U.S. Inland Rules apply inside the demarcation lines at the entrances to inlets, bays, rivers, etc. The demarcation lines are shown on coastal charts as magenta dashed lines. Once outside of the demarcation lines, International Rules apply.

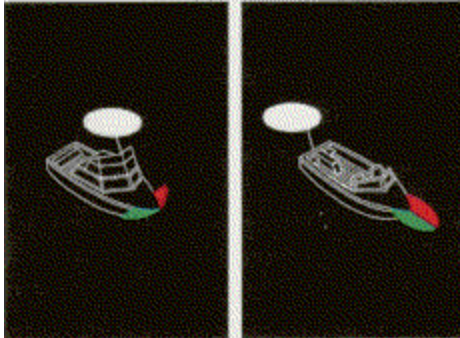
Figure 1



Power-driven vessels of less than 20 meters shall exhibit navigation lights as shown in Figure 1. (Note: 2 masthead lights are optional for vessels under 50 meters. Vessels over 50 meters will display two masthead lights.)

Power-driven Vessels

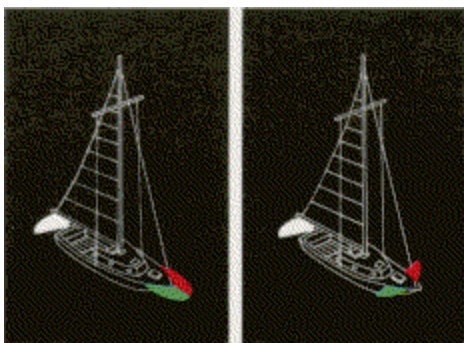
Figure 2



Vessels of less than 12 meters in length may show the lights in either Figure 1 or Figure 2.

Power-driven vessels of less than 7 meters whose maximum speed cannot exceed 7 knots may exhibit an all-around white light, and if practicable sidelights instead of the lights prescribed above, in international waters only.

Figure 3



Sailing Vessels and Vessels Under Oars

Sailing vessels less than 20 meters may exhibit the navigation lights shown in Figures 3 or 4.

Figure 4

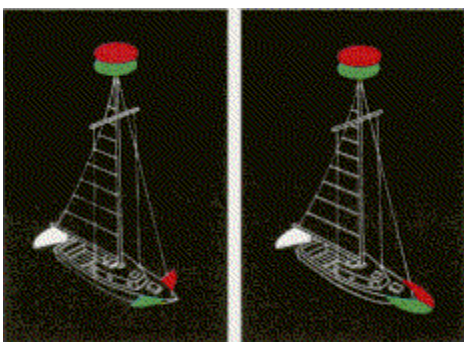
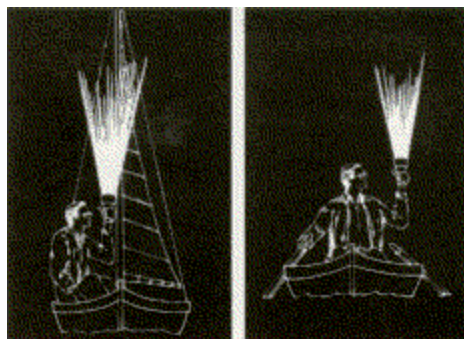


Figure 5



Another option for sailboats is to use a single combination lantern at the top of the mast as shown in Figure 5.

Figure 6



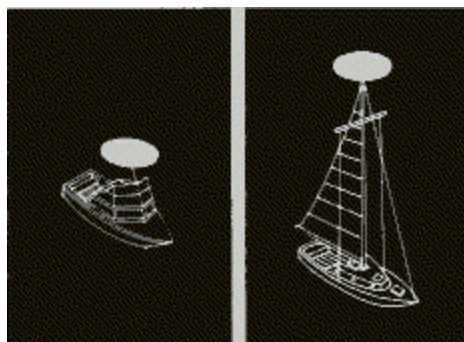
Sailing vessels less than 7 meters may carry an electric torch or lighted lantern showing a white light to be displayed in sufficient time to prevent collision (see Figure 6 - left picture). If practicable, the lights prescribed for sailing vessels less than 20 meters should be displayed.

Vessels under oars may display the lights prescribed for sailing vessels, but if not, must have ready at hand an electric torch or lighted lantern showing a white light to be displayed in sufficient time to prevent collision (see Figure 6 to the left).

Shapes and Lights

To alert other vessels of conditions that may be hazardous, there are requirements to display lights at night and shapes during the day.

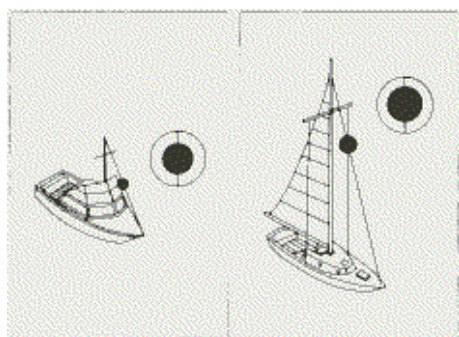
Figure 7



Anchored Vessels

Power-driven vessels and sailing vessels at anchor must display anchor lights. An anchor light for a vessel less than 50 meters in length is an all-around white light visible for 2 miles exhibited where it can best be seen (see Figure 7).

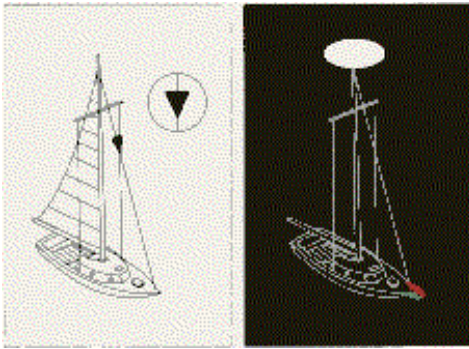
Figure 8



Vessels at anchor shall exhibit forward where best seen, a ball shape (see Figure 8).

Vessels less than 7 meters are not required to display anchor lights or day shapes unless anchored in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate. Anchor lights are not required on vessels less than 20 meters, anchored in special anchorages in inland waters designated by the Secretary of Transportation.

Figure 9

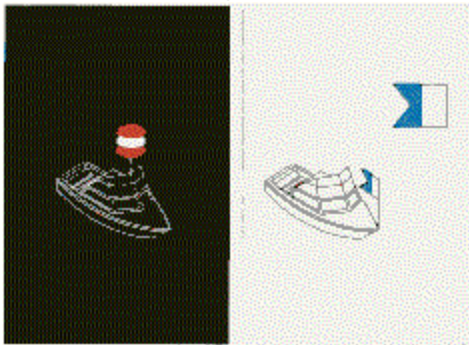


Sailing Vessels Under Power

Vessels under sail also being propelled by machinery, must exhibit forward where best seen, a conical shape with the apex pointing down (see Figure 9). Vessels less than 12 meters are not required to exhibit the dayshape in inland waters.

Sailing vessels operating under machinery, or under sail and machinery are considered power-driven and must display the lights prescribed for a power-driven vessel.

Figure 10



Restricted Maneuverability

The Navigation Rules require vessels restricted in their ability to maneuver to display appropriate day shapes or lights. To meet this requirement, recreational vessels engaged in diving activities may exhibit a rigid replica of the international code flag "A" not less than one meter in height or at night display the navigation lights shown in Figure 10. This requirement does not affect the use of a red and white divers flag that may be required by state or local law to mark a diver's location. The "A" flag is a navigation signal indicating the vessel's restricted maneuverability and does

not pertain to the diver.

Navigation lights should be checked prior to departing the dock and you should always carry spare bulbs.

Fire Extinguishers

Not all motorboats are required to carry a fire extinguisher, however it is highly recommended that you do. There are numerous types and sizes of extinguishers but each one has to be U. S. Coast Guard approved.

Fire Extinguishers are classified by letters and numbers according to the class and size fire they can put out. The letter indicates the class of fire. The number is a measure of the capacity of the extinguisher - the larger the number the greater the capacity to put out a fire.

Fire Classes



"A" is for combustible solids like wood.



"B" is for flammable liquids such as gasoline.



"C" is for electrical fires.



"D" is for combustible metals like magnesium

Although some boat fires involve burning wood and paper (Class A), these fires can be put out with water. Do not use water on gasoline, oil, or electrical fires. Water causes gasoline and oil fires to spread and electrical current is conducted through the water.

Make sure to inspect your fire extinguishers monthly to make sure they are properly stored, charged and undamaged. Portable extinguishers should be mounted where they are accessible. Check the gauge to make sure the extinguisher is still charged. Check the seals to make sure they have not been tampered with. Replace cracked or broken hoses and keep nozzles free from obstruction. You should also weigh them to assure that they meet the minimum weight stated on the label.

Once you use a fire extinguisher, you should either have it recharged, if it is rechargeable, or replaced if it is a disposable type. In any event, always make sure that your extinguisher label indicates that it is a U.S. Coast Guard approved marine type device.

Which extinguisher is best for which type of fire?

Type of Extinguisher	Class of Fire	Notes:
Carbon Dioxide (CO2)	B, C	Carbon Dioxide is a class B, C, agent only. Because of the CO2 high pressure, it is not recommended for use on Class A, amber and ash based fires. Why? Because of the hazard of spreading the fire when blasting it with the high-pressure gas.

Halon (until year 2000)	A, B, C	Halon 1211 carries the A, B, C rating only in a capacity of 9 pounds. Units smaller than 9 pounds only carry the B, C rating. Halon gas vaporizes to quickly to maintain a Class A fire in small quantities.
Dry Chemical	B, C	Dry chemical extinguishers come in three varieties. Sodium Bicarbonate B, C (Alkaline); Potassium Bicarbonate, Purple "K", B, C (Alkaline); and Mono Ammonium Phosphate A, B, C (Acidic). The A, B, C dry chemical is not recommended for marine use for two reasons: <ul style="list-style-type: none"> • It is corrosive • The way in which this agent obtains its class A rating is its ability to melt, seep and encase. This necessitates dismantling of equipment
Foam	A, B	Foam extinguishers are water based and quench Class A fires. They also blanket, smother and separate the vapor layer in Class B fires.

The fire extinguisher number (BI or BII) indicates the relative size of the extinguisher (minimum extinguishing agent weight).

Classification	Type of Extinguisher			
	Foam (Gallons)	Dry CO2 (Pounds)	Chemical (Pounds)	Halon (Pounds)
B-I	1.25	4	2	2.5
B-II	2.5	1.5	10	10

Coast Guard approved extinguishers are hand portable, either B-I or B-II classification and have a specific marine type mounting bracket. It is recommended the extinguishers be mounted in a readily accessible position.

All powerboats except outboards, less than 26 feet and of open construction must carry one B-I, U. S. Coast Guard approved fire extinguisher.

All powerboats 26 feet to less than 40 feet must carry two B-I or one B-II U. S. Coast Guard approved fire extinguishers.

Vessels 40 feet to less than 65 feet must carry three B-I or one B-II and 1 B-I U. S. Coast Guard approved fire extinguishers

Vessels over 65 feet must comply with Federal Standards.

Fire Precaution

Remove one element and you have no fire!



An onboard fire is a serious event. If the fire cannot be controlled where do you go except in the water? The fire triangle consists of fuel, oxygen and heat. All three must be present to start a fire and the removal of any single one can extinguish a fire.

Fuels, such as gasoline and propane, can be very dangerous if precautions are not taken. The fumes of these fuels are heavier than air and tend to collect in the cabin, bilge and other lower areas of the boat. Because they naturally are surrounded by oxygen all that is necessary to start a fire is heat. This could come from

something as simple as a spark from an ignition component. All you did was turn the key to start the engine and boom.

You should read and understand the instructions on your fire extinguisher(s). If a fire starts you should be prepared and not hesitate. Grab the fire extinguisher, activate it, and direct it at the base of the flames using short bursts and sweeping it from side to side. (More on this in the Chapter on Accidents.)

If underway and a fire starts, stop the boat and position it in such a manner that the fire is downwind. Order everyone to put on lifejackets. If possible try to turn off the fuel source to the fire. Grab the extinguishers and control the fire.

Ventilation

All vessels built after April 25, 1940 and which use gasoline for electrical generation, mechanical power or propulsion are required to be equipped with a ventilation system. The ventilation system may be either natural or powered:

1. A **natural ventilation system** consists of at least two ventilator ducts, fitted with cowls or their equivalent:

A minimum of one exhaust duct installed so as to extend from the open atmosphere to the lower portion of the bilge; and

A minimum of one intake duct installed so as to extend to a point at least midway to the bilge or at least below the level of the carburetor air intake.

2. A **powered ventilation system** consists of one or more exhaust blowers. Each intake duct for an exhaust blower should be in the lower one-third of the compartment and above the normal accumulation of bilge water.

NOTE: Boats built after July 31, 1980, which contain power exhaust blowers in gasoline engine compartments must have the following warning sticker near the instrument panel:

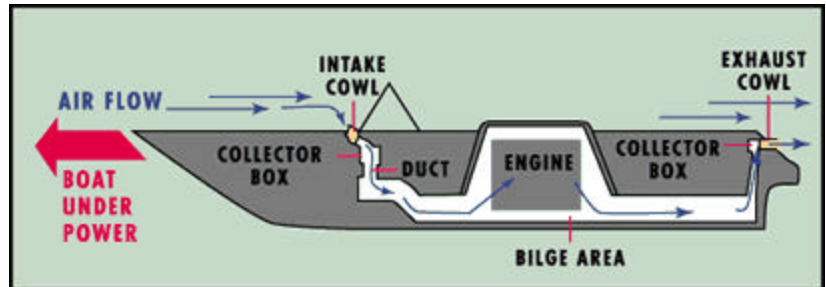
WARNING
GASOLINE VAPORS CAN EXPLODE.
BEFORE STARTING ENGINE OPERATE
BLOWER FOR 4 MINUTES AND CHECK ENGINE
COMPARTMENT FOR GASOLINE VAPORS.

All owners of boats equipped with exhaust blowers are strongly encouraged to take the same precautions before starting any gasoline engine.

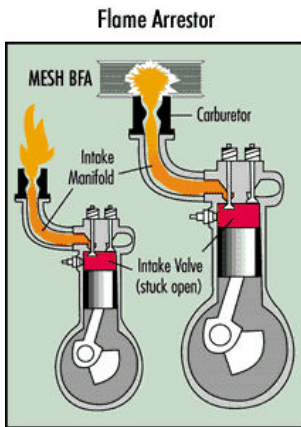
Note: The best test of successful ventilation is a "sniff" test! Use your nose to check the engine compartment, and bilge/s...don't rely on automatic sensors or alarms.

3. **Maintenance**- All owners are responsible for keeping their boat's ventilation systems in operating condition. This means making sure openings are free of obstructions, ducts are not blocked or torn, blowers operate properly, and worn components are replaced with equivalent marine type equipment.

Ventilation System Diagram



Backfire Flame Arrestor



Internal combustion engines can backfire. In order to prevent flames from the backfire causing a fire onboard, a U. S. Coast Guard, UL, or SAE approved Backfire Flame Arrestor must be attached to the air intake with a flame tight connection. All motorboats have this requirement except outboards and diesels.

It is very important to insure that your Flame Arrestor is clean and undamaged. If there is a hole in the grid, or oil or gasoline in the grid, or if it is not properly attached, it will not work correctly.

You, the owner of the boat, are responsible for keeping your boat's ventilation systems in operating condition. Make sure openings are free of obstructions, ducts are not blocked or torn, blowers are operating properly and worn out parts are replaced with equivalent marine type equipment.

Sound Signaling Devices



All boats less than 12 meters in length must carry an efficient sound producing device which can be heard for one half mile. Most often these are whistles or horns. Boats over 12 meters (39.4 feet) in length must also carry a bell. The rules of the road, both inland and international, specify that boats give sound signals to communicate intentions in heavy traffic, and to alert other skippers of your presence in fog, heavy rain or other times of restricted visibility.

Visual Distress Signals

Most recreational boats, and all boats operating in coastal waters, Great Lakes and the high seas, must be equipped with visual distress signals. These signals must be U. S. Coast Guard approved and are categorized for day use, night use or combination day and night. These

signaling devices must be in serviceable condition, stowed where readily accessible and marked with a date showing serviceable life. Make sure they have not expired. (Distress flares, smoke flares and meteor rockets have expiration dates 42 months after the date of manufacture.)

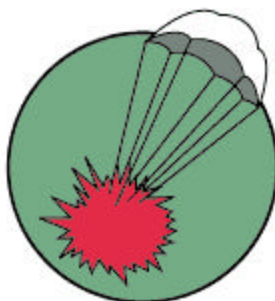
The U. S. Coast Guard regulations prohibit display of distress signals except when a distress actually exists. You should only use distress signals when help is close enough to see the signal. The U. S. Coast Guard recognizes both pyrotechnic and non-pyrotechnic devices.

Pyrotechnic Devices

Pyrotechnic Device Examples



Red Flare
(hand-held/day and night)



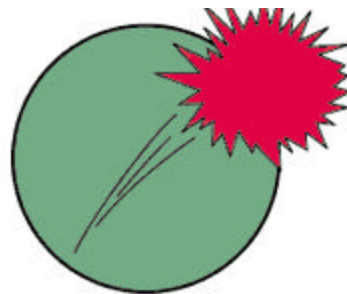
Parachute Flare
(day and night)



Orange Smoke Signal
(hand-held/day only)



Floating Orange Smoke Signal
(day and night)



Red Meteor

Pyrotechnic Red Flares

hand-held or aerial:

- For day/night use
- 2 minute burn time
- 5000 candle power
- use in sight of ship or plane

Launchers for aerial red meteors or parachute flares:

- Approved for day/night use
- 6 second burn time
- 250 feet altitude
- 10,000 candle power
- use in sight of ship or plane-near ship or plane at night
- check with State for firearms requirements

Pyrotechnic orange smoke, hand-held or floating:

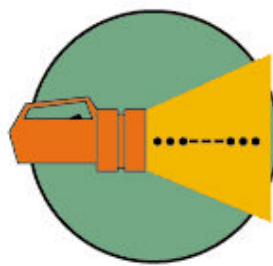
- Day time use only
- 50 Second burn time
- Produces cloud of orange smoke

Non-Pyrotechnic Devices Include:

Non-Pyrotechnic Device Examples



Orange Flag
(day only)



Electric Distress Signal
(night only)

General Information about flares

- Read and understand the instructions
- Note expiration date and replace as necessary
- Hold lighted flares downwind and away from the boat
- Do not point them at anyone and hold away from your body
- Store in a watertight container such as a zip-lock bag
- Store where readily accessible and ready to use
- Use only in case of an emergency

Requirements

The following vessels are not required to carry day signals but must carry night signals when operating from sunset to sunrise:

- Recreational boats less than 16 feet in length.
- Boats participating in organized events such as races, regattas, or marine parades.
- Open sailboats less than 26 feet in length not equipped with propulsion machinery.
- Manually propelled boats.

Vessels 16 feet to 65 feet must carry both day and night signals.

Any of the following signals, when carried in the number required, can be used to meet the requirements. Note the "time of day" approved as compared to the time of operation.

Approved Visual Distress Signals Pursuant to 33 CFR 175.130

46 CFR Approval #	Device Description	Meets Requirements For	# Required
160.021	Hand Held Red Flare	Day and Night	3
160.022	Floating Orange Smoke	Day Only	3
160.024	Parachute Red Flare	Day and Night	3
160.03	Hand-Held Rocket Propelled Parachute Red Flare	Day and Night	3
160.037	Hand-Held Orange Smoke	Day Only	3
160.057	Floating Orange Smoke	Day Only	3
160.066	Red Aerial Pyrotechnic Flare	Day and Night	3
161.013	Electric Distress Light	Night Only	1
160.072	Orange Flag	Day Only	1

The following illustrates the variety and combination of devices which can be carried in order to meet the requirements:

- Three hand-held red flares (day and night).
- One hand-held red flare and two parachute flares (day and night).
- One hand-held orange smoke signal, two floating orange smoke signals (day) and one electric distress light (night only).

Pollution Regulations

The Refuse Act of 1899 prohibits throwing, discharging or depositing any refuse matter of any kind (including trash, garbage, oil and other liquid pollutants) into the waters of the United States.

Oil and Hazardous Substances

The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances that may be harmful into U.S. navigable water. Vessels 26 feet in length and over must display a placard at least 5 by 8 inches, made of durable material, fixed in a conspicuous place in the machinery spaces, or at the bilge pump control station, stating the following.

Discharge Of Oil Prohibited

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States or the waters of the contiguous zone if such discharge causes a film or sheen upon, or discoloration of, the surface of the water, or causes a sludge or emulsion beneath the surface of the water. Violators are subject to a penalty of \$5,000.

Regulations issued under the Federal Water Pollution Control Act require all vessels with propulsion machinery to have a capacity to retain oily mixtures on board. A fixed or portable means to discharge oily waste to a reception facility is required. A bucket or bailer is suitable as a portable means of discharging oily waste on recreational vessels. No person may intentionally drain oil or oily waste from any source into the bilge of any vessel.

You must immediately notify the U.S. Coast Guard if your vessel discharges oil or hazardous substances in the water. Call toll-free 800-424-8802 (In Washington, D.C. (202) 267-2675). Report the following information:

- Location
- Size
- Substances
- Source
- Color
- Time observed

Regulations Controlling Disposal of Garbage

The U.S. Coast Guard regulations prohibit dumping of plastic refuse, and garbage mixed with plastic, into any waters. These restrictions apply to all U.S. vessels wherever they operate (except waters under the exclusive jurisdiction of a State), and any foreign vessels operating in U.S. waters out to and including the Exclusive Economic Zone (200 miles).

<i>It is illegal to dump:</i>
Inside 3 miles and in U.S. Lakes, Rivers, Bays and Sounds and anywhere on the Great Lakes no matter how far from shore: Plastic, dunnage, lining, and packing materials that float and any garbage except fishwater/graywater/fresh fish parts.
3 to 12 miles Plastic, dunnage, lining, and packing materials that float and any garbage not ground to less than one square inch.
12 to 25 miles Plastic, dunnage, lining, and packing materials that float.
Outside 25 miles Plastic

Your Obligations

Do not dispose of plastic in any waters. Learn and conform to the regulations regarding disposal of other garbage. For instance, it is illegal within three nautical miles to operate a garbage disposal in a galley sink if it discharges that garbage - even ground up garbage. To make it easier to comply, you might want to separate garbage according to the disposal limitations.

State and local regulations may further restrict the disposal of garbage. Make sure you know the regulations covering the waters upon which you will be boating.

Your Responsibilities

If you observe any boat not complying with these regulations regarding water pollution, report it to the nearest Coast Guard Marine Safety Office (MSO). To locate the MSO near you, call the toll free Coast Guard Hotline -- 1-800-368 5647.

State and local regulations may further restrict the disposal of garbage. Make sure you know the regulations covering the waters upon which you will be boating.

SOS Placard

Boats 26 feet in length and over must display a Save Our Seas Placard that outlines the rules of dumping waste offshore. These placards may be purchased from local marinas, boat dealers, and marine equipment suppliers.

Waste Management Plans

U.S. recreational boats 40 feet or more in length and equipped with a galley and berthing are required to carry a Waste Management Plan if the vessel operates, or is certified to operate, beyond 3 nautical miles from shore.

Marine Sanitation Devices

Recreational boats are not required to be equipped with a toilet. However, the Clean Water Act requires that if a toilet is installed, it must be equipped with an operable Marine Sanitation Device (MSD) that is certified by the Coast Guard. Installed toilets that are not equipped with an MSD, and that discharge raw sewage directly over the side, are illegal.

Portable toilets or "porta-potties" are not considered installed toilets and are not subject to the MSD regulations. But they are subject to disposal regulations that prohibit the disposal of raw sewage within territorial waters (3 mile limit), the Great Lakes, or navigable rivers.

No Discharge Zones

A boat can be equipped with any type of MSD permitted under the regulations. However, whenever a vessel equipped with a Type I or Type II MSD (these types discharge treated sewage) is operating in an area of water that has been declared a No Discharge Zone, **the MSD cannot be used and must be secured to prevent discharge**. No Discharge Zones are areas of water that require greater environmental protection and where even the discharge of treated sewage could be harmful. When operating in a No Discharge Zone, a Type I or Type II MSD must be secured in some way to prevent discharge. Closing the seacock and padlocking, using a non-releasable wire-tie, or removing the seacock handle would be sufficient. Locking the door to the head with a padlock or a door handle key lock is another acceptable method of securing the MSD while in a No Discharge Zone.

Generally, all freshwater lakes (and similar freshwater impoundments or reservoirs that have no navigable connections with other bodies of water), and rivers not capable of interstate vessel traffic, are by definition considered No Discharge Zones.

In addition, States may (with the specific approval of the U.S. Environmental Protection Agency) establish No Discharge Zones in other waters within the State. Currently, the following States have established such EPA-approved No Discharge Zones:

California, Florida, Massachusetts, Michigan, Minnesota, Missouri, Mississippi, New Hampshire, New Mexico, New York, Rhode Island, Texas, Vermont, and Wisconsin.

Others are planning to follow suit. Boaters should check with their State Boating Law authority for more specific information on the location and limits of No Discharge Zones.

Discharge of Raw Sewage

It is illegal to discharge raw sewage from a vessel in territorial waters (within the 3 mile limit), the Great Lakes, and navigable rivers. However, a valve may be installed on any MSD to provide for the direct discharge of raw sewage when the vessel is outside U.S. territorial waters. The valve must be secured in a closed position while operating in U.S. waters. As described under **NO DISCHARGE ZONES**, use of a padlock, non-releasable wire-tie, or the removal of the valve handle would be considered adequate securing of the device. The method chosen must be one that presents a physical barrier to the use of the valve.

NOTE: The boundaries of U.S. territorial waters are marked on some nautical charts. Changes to the boundaries are published in Coast Guard Local Notices to Mariners.

Recommended Equipment

In addition to all the equipment that the U. S. Coast Guard requires, certain equipment and supplies just make common sense to have. DOI regulations (485 DM 22.4.A.3) stipulate that in addition to "...basic safety devices required... department watercraft will be outfitted, based on expected conditions, with other equipment necessary for safe operation...". These items should be selected based on the size, location and use of your boat.

The following are items that should be carried aboard:

- VHF Radio or cellular phone
- Anchor and ground tackle/spare anchor
- Bilge Pump and or bailer
- Boat hook
- Charts and navigation publications
- Visual Distress Signals
- Spare fuel
- Spare propeller/s
- Alternate means of propulsion (oars-paddles-kicker engine)
- Compass
- Detectors and alarms
- Fenders
- Dock lines /heaving lines
- First aid kit
- Flashlight and searchlight and mirror
- Spare parts and tools
- Windshield wipers
- Tow Bridle
- Sun screen and sun glasses
- Survival gear (exposure suit, space blanket, shelter, fire making tools, etc.)
- Extra clothing, food and water
- Customized PFD (see section on PDF'S)

Chapter III - Preparation

Vessel Check List

We have discussed in the previous section all of the required equipment for a safe outing. In addition to the minimum requirements, common sense tells us that we should check everything about our boat that could make the difference between an enjoyable recreation and a disaster.

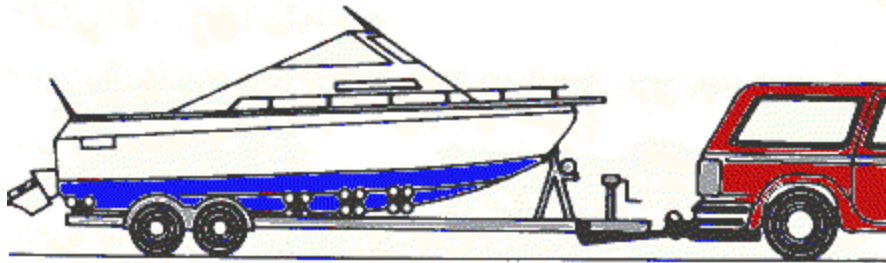
Just as pilots have a pre-flight checklist, we too should have a pre-departure checklist. It just makes it simple to go down the list and check each item. This could prevent an unpleasant event or even save lives.



At the end of this chapter you will find a sample pre-departure checklist that can be modified for use on your particular boat.

Trailer

The majority of recreational boats in the United States are trailered to and from the water. Your boat trailer is only one part of the entire boating package that includes the boat, trailer, hitch and towing vehicle. Neglecting the trailer's maintenance can result in damage to your boat, your towing vehicle or both.



The trailer must have a load capacity adequate to carry the boat, motor, fuel and all equipment that may be carried in the boat as it is trailered. By law, trailers are classified by the maximum amount they may weigh when fully loaded. It is highly suggested that you never exceed 85% of a trailer's total capacity.

Gross Vehicle Weight Rating (GVWR)

Class 1 - GVWR to 2000 lbs. (suggest 1700)

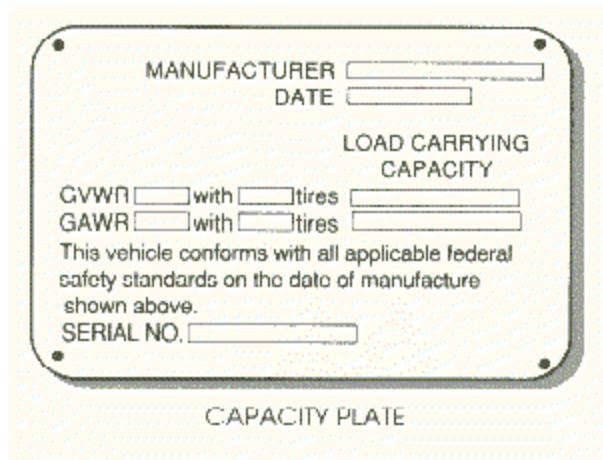
Class 2 - GVWR to 3500 lbs. (suggest 2975)

Class 3 - GVWR to 5000 lbs. (suggest 4250)

Class 4 - GVWR + 5000 lbs. (suggest 85%)

Your trailer will also have a Gross Axle Weight Rating (GAWR) that is used to describe the minimum tire rating needed for that load. It must be at least equal to the GVWR.

All these numbers, plus trailer identification number, are on a capacity plate.



Types of trailer beds

- Rollers- support the boat on system of rollers; allow easier launch.
- Bunks (pads)- provide better support than rollers, but launching and retrieval require that the boat float off or on the trailer.

Trailer Selection

- Load Rating- Boat, fuel, motor, gear etc. Check Manufacturers Specs.
- Load Height- Center of gravity when loaded, visibility/mirrors.
- Length- Support stern area and transom without overhang.
- Support- Good rollers, pads or combination.
- Brakes- Electric or hydraulic on trailers hauling >1500 lbs gross weight.
- Winch- Appropriate nylon strap or steel cable for weight.
- Lights- Waterproof, mounted high if possible.
- Motor Support- Transom saver.
- Safety Chains- Must be strong enough to support GVWR of trailer, and long enough to allow for turning, yet not drag on ground.
- Spare Tire- Purchase spare tire with trailer or obtain one matched to trailer GVWR. Confirm wheel/lug design matches existing setup. Mount on trailer.

Another very important item to consider is the towing vehicle. It also must meet certain performance standards such as engine power, engine cooling, transmission cooling, wiring, brakes, battery, suspension, alternator, axle ratio, tires, and wheels in order to tow the boat and trailer. You should consult your dealer for advice. Each tow vehicle also has a maximum weight that it may pull by law. Again, it is suggested that you not pull more than 85% of the vehicle's limit.

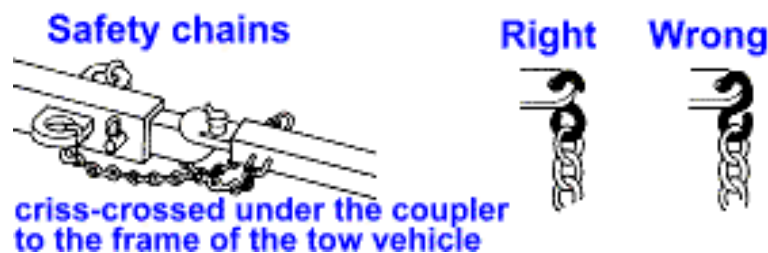
Tow Vehicle Selection

- Load Rating- Manufacturers load rating.
- Add-ons- Stabilizers, transmission cooler, oil cooler, mirrors.
- Hitch- Manufacturers suggested type, properly sized to match vehicle and trailer/load.
- Ensure ball matches hitch and load. Equalizing type recommended >2000 lbs gross weight.
- Tires- Manufacturers suggested type.
- Transmission- Manufacturer's recommendation (many suggest automatic transmission).

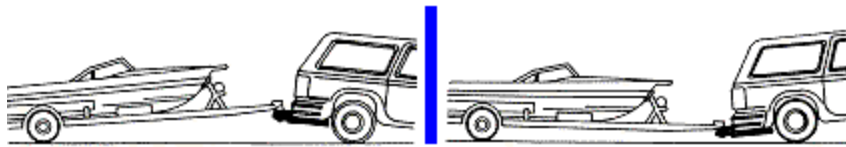
Hitch/Coupler/Ball Selection

- Hitch Class- Dependent on GVWR of your trailer. If you're at or near the GVWR for a hitch class, move to the next higher rated hitch. Another rule of thumb is to buy the hitch that's strong enough to match the maximum rating of your tow vehicle.
- Attachment- Attach hitch to frame of vehicle by bolting or welding. Do Not Use bumper hitches!
- Equalizing Hitches- Recommended for loads over 2,000 pounds and most over 3,500 pounds. See tow vehicle owners manual.
- Ball and Coupler- Select according to GVWR of trailer or maximum rating of tow vehicle. Solid steel balls recommended.
- Receiver Hitch- These have removable ball mount platforms. They are ideal for height adjustment, and for security of ball when not in use. Select by GVWR or maximum rating or tow vehicle.

The trailer is attached to the towing vehicle by a trailer hitch. A socket on the front of the trailer drops over a ball on the back of the hitch and then locks down. These two parts must match in size. The ball size is determined by the class of trailer. The hitch should be permanently attached to the towing vehicle and should handle the load you are attempting to pull. Bumper hitches (attached to bumper only) are illegal in some states and not recommended.



In addition to the trailer's capacity weight you must also consider "tongue weight." The weight of the trailer tongue that attaches to the towing vehicle should not be more than five to fifteen percent of the total weight of the rig. Adjusting the tongue weight by moving the balance point of the trailer makes the tow more stable. If the tongue weight is too low, the trailer will fishtail at high speed. You should shift weight forward to increase the tongue weight. If the tongue weight is too high, it will drag down the rear of the tow vehicle and make steering difficult.



Too much weight on the rear of the trailer will cause the trailer to fishtail and may reduce traction or lift the rear wheels of the tow vehicle off the ground.

Too much weight on the hitch will cause the rear wheels of the tow vehicle to drag and may make steering more difficult.

Rollers and/or pads are used to support the boat on the trailer. There should be sufficient support so as not to allow the boat to warp. You should make sure that all support surfaces are in contact with the boat at all times. Tie down straps should be used to secure the boat to the trailer both fore and aft. In addition, all fuel tanks and other equipment inside the boat should be secured so that its weight does not shift during towing.

NEVER CARRY GASOLINE TANKS IN THE TRUNK OF THE TOW VEHICLE.

Preparing to tow safely

- Drain accumulated water from the boat's bilge by removing plug.
- Weight properly distributed, 5-10% on tongue.
- All gear, covers, tips, secure.
- Lower the tongue socket onto the ball on the trailer hitch and lock together securely.
- Connect trailer lights to towing vehicle and check turn signals, brake lights and backup lights.
- Attach safety chains from trailer to tow vehicle securely in a criss-cross fashion to form an "X".
- Trailer jack stand up.
- Check tie-down straps and winch and cable.
- Winch ratchet engaged, bow safety chain/fastener, and transom strap/s secure.
- Motor or drive unit tilted and secured (use transom saver if recommended by manufacturer)
- Make sure wheel bearings run free and are properly lubricated.
- Check tire pressure include spare, lug nuts and test brakes.
- Make sure to stow drain plug in the boat so any remaining water can drain and it is there when you get to the ramp.
- Adjust mirrors
- Don't forget the keys to the boat.
- Allow more distance for braking, maintain safe distance from vehicle in front and allow extra room for turns.

Road Handling

The weight that you are trailing will make your towing vehicle less responsive in many respects. Speeding up, slowing down and all maneuvers will require more time to accomplish. Leave more room between you and a vehicle in front of you to make sure you can stop should they brake suddenly.

Make sure your side view mirrors are large enough to provide an unobstructed rear view on both sides of the vehicle.

Remember that the turning radius is much greater. Curbs and barriers must be given a wide berth when turning corners. Backing a trailer can be somewhat tricky but with practice you should be able to accomplish the task in a minimum amount of time. The trailer will turn in the

opposite direction of the car; take it slowly and try to avoid over-steering. Prior to operating on the open road, practice turning, backing up, etc. on a level, empty parking lot.

Launching

1. Do initial launch preparations away from the ramp so as not to impede launching for others.
2. Raise the outdrive or motor, remove the support bracket and install the drain plug.
3. Disconnect the trailer wiring. Remove tie down straps and again check the drain plug.
4. Make any equipment adjustments necessary and check the drain plug.
5. Connect the fuel tank, check fluid levels and check the drain plug.
6. Drive to the ramp and back the boat and trailer down the ramp, keeping the tow vehicle's wheels out of the water.
7. Set the emergency brake, shift into Park, and block the wheels.
8. Someone should get aboard the boat, turn on the blower, lower the motor, look for water entering the boat, sniff the bilge and start the motor.
9. Make sure you have attached a bowline to the boat, then release the winch and disconnect the winch line.
10. You should be able to launch the boat with a slight shove or by backing the boat off the trailer under power.
11. Return the towing vehicle to the parking lot as soon as the boat is launched so the next person in line may proceed.
12. Move the boat to an area away from the ramp to load additional equipment and passengers.

Retrieval

The steps for retrieving the boat are essentially the reverse of launching and you should keep in mind being courteous of others launching and retrieving.

1. Unload the boat away from the ramp if possible.
2. Back the trailer into the water, again keeping the tires of the tow vehicle at waters edge, not in the water.
3. Maneuver the boat carefully onto the submerged trailer, attach a bowline and shut off the engine prior to raising it.
4. Winch the boat onto the trailer and secure it.
5. Drive the trailer and boat out of the ramp for cleanup, reloading, securing equipment and safety check.
6. Remove the drain plug to allow water to drain from the bilge.

Environmental Conditions

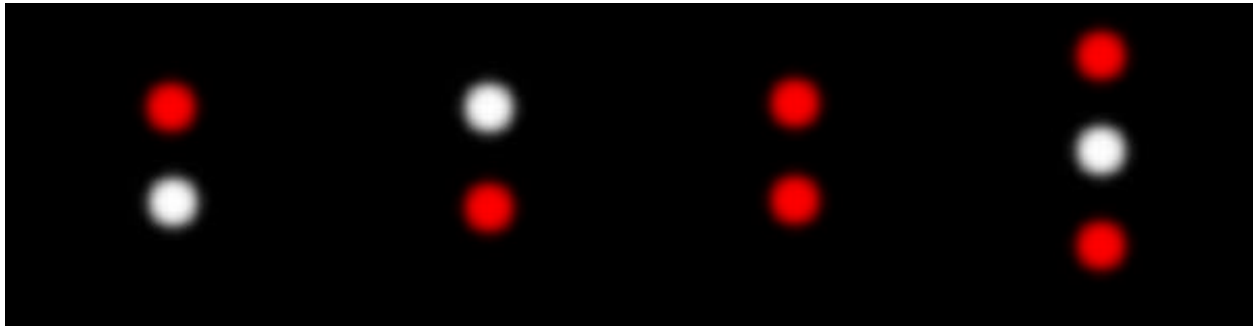
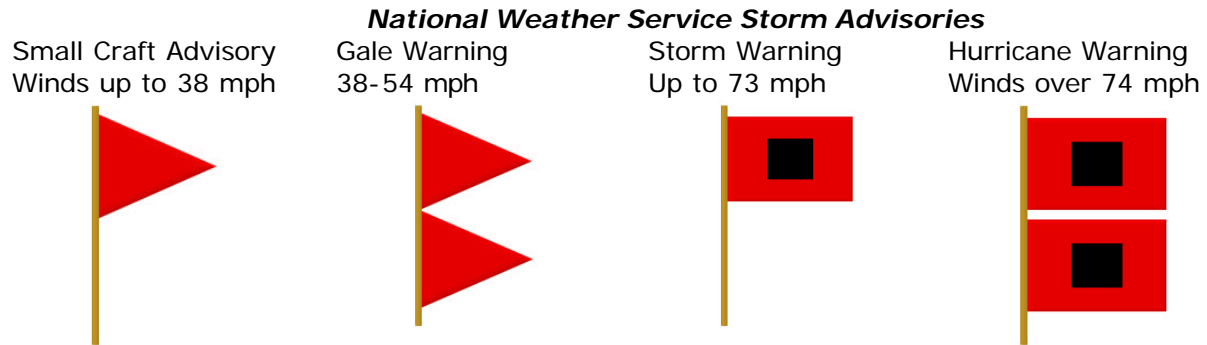


Weather

You should never leave the dock without first checking the local weather forecast. You can get weather information from TV, radio or from one of the weather channels on your VHF radio. At certain times of the year weather can change rapidly and you should continually keep a "weather eye" out, especially to the west, in order to foresee changes that might be impending.

There are indicators that you can look for that indicate an approaching weather change:

- [Weather changes generally come from the west](#) so scan the sky with your weather eye, especially to the west.
- A sudden drop in temperature and change in the wind often means that a storm is near.
- If you have a barometer on your boat check it every two to three hours. A rapid drop in pressure means a storm is approaching.
- Watch for cloud build up, especially rapid vertically rising clouds.



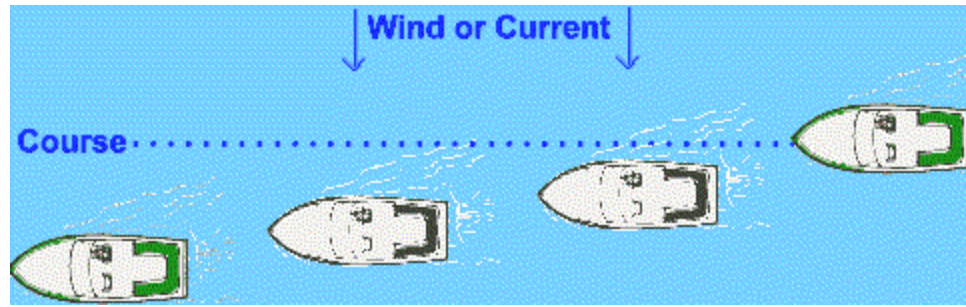
IF A STORM IS NEAR...

- Reduce speed and proceed with caution
- Ensure that PFDs are securely fastened. (must be worn at all times)
- Close all hatches and ports.
- Head for the nearest shore that is safe to approach and duck into the lee of land.
- Put the bow into the wind and waves at about a 40-degree angle and watch for floating debris.
- Pump out bilges and keep dry.
- Change to a full fuel tank.
- Secure loose items that could be tossed about.
- Keep everyone low in the boat and near the centerline.

Leeway

[Wind or current pushing your boat off course causes leeway](#). Boats with a large amount of surface area above the waterline (freeboard) will be affected by the wind to a greater degree than low profile boats. Additionally, boats with a large keel or underwater profile will be affected by current to a greater degree than planing boats with less structure under the water. You should compensate for leeway by steering into wind or current in order to make good a straight course to your destination.

You can visualize leeway by looking back at your wake while on a steady compass heading. If your wake is not following directly behind you, but being set to one side or the other, you are experiencing leeway and should correct.



Tide and Current

Tide is the rise and fall of the water's surface. The tidal range is the amount of difference in low tide and high tide. Tidal range and its resulting effect on the depth of the water may be insignificant in some areas but in others you may have tides that rise and fall up to fifty feet. You should always be aware of the state of the tide especially when leaving and returning to shallow water.

Current is the flow of the water either from or to the sea as the tide rises and falls. You should be aware of the effects of current on your boat. Current may flow as rapidly as five knots. If you lose an engine and are pushed along with current you could be swept out to sea or pushed aground.

Specific Local Hazards

You should be aware of, and plan for, any specific local hazards in the area in which you will be boating. You should have charts onboard for all areas you boat in. If you are boating in an area for the first time, seek assistance from other boaters or marinas with local knowledge who can inform you of additional safety precautions which must be considered.

You should be aware of any and all of the following:

- Hazardous Inlets
- Shoaling areas
- Whitewater areas
- Dams
- Locks
- Abnormal tides or currents

Make sure you check with state and/or local officials for requirements and specific conditions that may apply to a body of water on which you intend to boat. For example, some lakes prohibit any motorized vessels, while others might prohibit personal watercraft or have specific hours of operation.

Locks



When traversing connected navigational areas with considerable difference in water levels you may encounter locks. These are used to move boats up or down from one level to another.

Locks operate on a simple premise. You drive your boat into a chamber with gates at each end. To raise the boat, water is let into the chamber until it is the level of the water to be entered. When the water reaches that level the gates on the new elevation side are opened and you drive out.

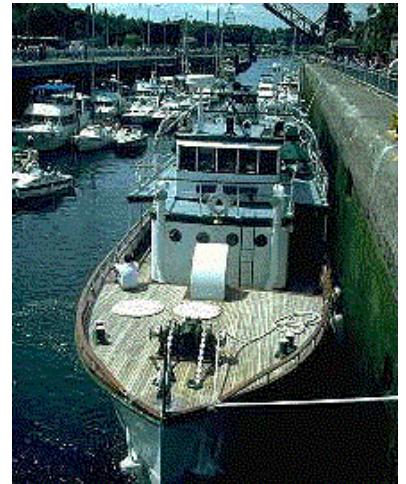
To go to a lower level, you enter the chamber and the gates are closed and water is let out until you are even with the lower level. The gates on that side are opened and again you drive away.

The lockmasters are responsible for the safety of vessels going through the locks. Their instructions should be followed precisely. You normally will call the locks on your VHF radio and make arrangements to enter the lock. (The VHF channel changes in different parts of the country but 13 is a good place to start if you do not already know the channel or it is not indicated on a sign at the entrance to the lock.)

You may, however, give two long and two short blasts from your horn and follow the light signals that are displayed at each entrance to the lock. Generally, they work similarly to a traffic light. A red light means stop, you cannot enter the lock and you must stay clear of any traffic about to exit the lock. A yellow light sometimes displayed means the lock is preparing for your entrance but still stay cautiously clear. A green light means the boat may enter the lock with caution and follow the instructions of the lockmaster. (Sound and light signals may be different in different parts of the country. Investigate beforehand.)

Prior to entering the lock you should have fenders rigged on both sides of the vessel. You should have crew in PFDs ready to handle lines and loop, not tie, them to the posts, bollards or lock wall ladder rungs on the side of the lock the lockmaster has indicated. Keep hands and feet clear of the boat and wall. Use a boat hook or paddle to fend off if necessary. Your crew handling the lines will have to adjust them as the water level rises or falls. Your lines should be at least twice the depth of the lock. Once secure in the lock shut off your engine.

As soon as the water in the lock reaches the proper level, the gates are open and the lockmaster has indicated that you should do so, you should cast off lines and exit with caution.



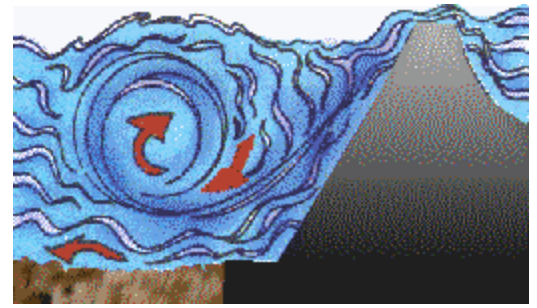
Dams

Dams are built to back up water in a reservoir for a variety of reasons. This wall-like structure pools the water as it flows over the crest and drops to the lower level.

This drop creates a hydraulic, which is a backwash that traps and re-circulates anything that floats. Boats and people have been caught in this backwash. A person caught in the backwash of a low-head dam will be carried to the face of the dam, where the water pouring over it will wash him down under to a point downstream called the boil. The boil is that position where the water from below surfaces and moves either downstream or back toward the dam. A person who is

caught in a low head dam struggles to the surface, where the backwash once again carries him to the face of the dam, thus continuing the cycle.

To complicate matters, these dams are usually loaded with debris, such as tires and logs on the surface and rocks and steel bars just below, posing additional problems should a person get trapped in this dangerous structure.



Dams do not need to have a deep drop to create a dangerous backwash. During periods of high water and heavy rains, the backwash current problems get worse, and the reach of the backwash current is extended downstream.

Small low-head dams that may have provided a refreshing wading spot at low water can become a brutal death trap when river levels are up. Simply put, it is not the drop of the dam which is the lethal danger, but the backwash current. This backwash current is governed by volume of water and flow.

From downstream, you may not realize the danger until it's too late. From upstream, low-head dams are difficult to detect. In most instances, a low-head dam does not look dangerous, yet can create a life-threatening situation. You should always pay attention to warning signs, markers or buoys and keep well clear of low-head dams.

Float Plan

Pilots, for years, have filed flight plans with the FAA prior to setting off on a trip. Although the U.S. Coast Guard does not require one, it's a good idea to prepare a float plan and give it to a responsible person before getting underway. This plan should outline your boating itinerary including your time of departure and arrival. It should also give information as to the description of your boat, the number of passengers aboard and instructions on what to do if you are overdue. You will find a generic float plan that may be copied and edited for your own needs at the end of this chapter.

Please remember to leave your float plan with a responsible person such as a family member or a friend. The U.S. Coast Guard cannot, and will not, accept float plans. You will find a sample float plan at the end of this chapter.

Preventive Maintenance

Keeping your boat in good working order is just as much a part of the boating experience as the boating itself. Almost all elements of safety revolve around the fact that the boat has been maintained and all its parts and systems are able to perform as they were designed. Negligence in this area will eventually lead to an unsafe or disastrous experience.

Engine

You should get in the habit of not only inspecting and checking all the engine components and fluids each and every time you go boating, but some time must be spent doing periodic maintenance.

Normal, scheduled, engine maintenance should be carried out according to the manufacturers recommendations (Check owner's manual or shop manual if available). The following is a partial list meant only as a general guide:

Engine maintenance tips include:

- Grease all fittings and drive parts of the engine and drive train with proper lubricants.
- Change lower unit (gear case) lubricants at least every 100 hrs of operation or once each season whichever occurs first. Change water pump impeller at the same time (more often in areas where water is sandy).
- Inspect spark plugs, clean or replace as necessary. Note: Do not pull on rubber spark plug terminal, grasp connector at base, twist back and forth with gentle pulling action to remove.
- Inspect/replace zinc/s (anode).
- Check water/fuel separator.
- Inspect water intake and weep hole for obstructions.
- Check engine for loose hose connections, leaks, or parts lying inside lower housing tray.
- Check and replace engine oil, transmission oil and other fluids as needed.
- Check battery fluid level, terminals and connectors. Use only "marine grade" batteries and connectors.
- Winterize according to manufacturers recommendations (usually involves removal of fuel from fuel lines and assuring there is no water in system to freeze).
- Check zincs on cooling system every six months.

Battery Installation

- Install in well-ventilated area.
- Protect from extremes of heat/cold.
- Should be close to appliance served.
- Keep away from fuel fumes.
- Secure against horizontal/vertical movement.
- Cover with non-conductive material.
- Keep accessible.

Battery Maintenance

- Minimize or eliminate deep-discharge cycles.
- Use properly controlled charging procedure/current.
- Maintain electrolyte level.
- Keep battery and terminals clean and connectors tight.
- Provide good ventilation.
- Consider usage of a multistage onboard battery charger to improve battery life.

NOTE: Gel-cell batteries have many advantages and are virtually maintenance free, however they require careful voltage regulation during charging, and should not be left in a partially discharged state for long.

Propeller Maintenance

Examine propeller after each use looking for chips, nicks and bends. A damaged propeller can significantly reduce performance efficiency and fuel economy, and can be further damaged due to cavitation erosion. Excessive damage or unbalanced damage can cause fatigue damage to other parts of your engine.

- Small burrs or dings can be dressed with a file.
- Remove and clean propeller if you find fish line wrapped around the shaft.
- Replace propeller if damaged by being bent or a series of nicks are present (dealers can recondition most props).
- Remove prop and grease shaft annually.

Hull Maintenance

- Cleaning- Condition of the boat's bottom will affect performance. A dirty hull will reduce speed and fuel efficiency, as well as spread exotic/noxious plant/animal life. Check manufacturers recommendations concerning cleaning methods and materials, these vary by hull material. Check transom area for cracks.
- Leaks- Inspect all joints and/or seams for signs of wear and leaks. A first clue of trouble could be water in the bilge.

Other Component Maintenance

Steering assemblies must be lubricated periodically according to manufacturers recommendations. Decks, fittings, hardware, canvas and other installed equipment must be kept clean and serviced as required by their manufacturers. These components are exposed to all types of weather, UV radiation, and a corrosive environment. They will tend to wear out or malfunction more regularly than when used at "home". Purchase only "marine grade" components or replacement parts when available.

Keep the hull and decks of the boat clean and properly waxed. This not only protects the hull from deterioration from the sun but a clean hull will give you better fuel efficiency. Fiberglass should be cleaned with fresh water and a non-abrasive soap. If necessary, a soft brush should be used to help remove debris caught in crevices. Patch any cracks that may occur due to stress, age or accident.

Keep all aluminum and stainless parts clean and polished with a good metal wax. Metals on boats corrode quickly, especially in a salt-water environment, if not adequately maintained. Check all screws, bolts and other fittings to keep secure. Protect the value of your boat. You may someday want to trade it in on another one.

The majority of failures in modern day boats are caused by corroded electrical systems. Keep all electrical fittings dry, free of corrosion and coat with water repelling, non-conductive grease or corrosion inhibitor such as Pertox.

If at all possible, keep your boat under cover in a garage, carport or boat storage unit. At minimum keep a cover on your boat to protect the topsides, floors, seats etc. from the effects of the sun and rain.

Systems

Especially important in larger vessels is the continual maintenance of each system on the boat. An adequate and properly working system, which does what it was designed to do, will make each boating experience a pleasant one. Provide preventive maintenance according to the manufacturer's recommendation to the following:

Fuel system

Fresh water system

Generator

Electrical

Batteries

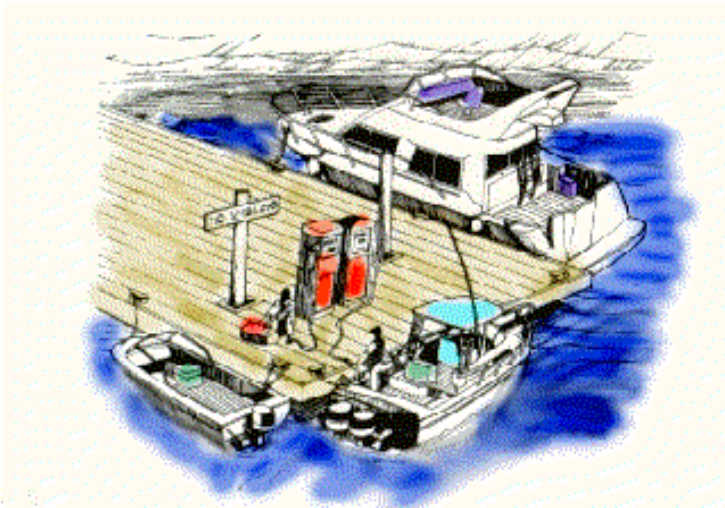
Air Conditioning

Refrigeration

Head and waste system

Cooking Facilities

Fueling



Proper fueling procedures are very important in preventing onboard fires. Gasoline vapors are heavier than air and can spread rapidly into enclosed spaces. You should check the bilges and all closed compartments for gasoline vapors. The sniff test is the most effective method for detecting fuel leaks.

Fueling Precautions

1. Secure boat to the dock.
2. Switch off engine(s).
3. Extinguish all open flames.
4. Do not use electrical switches.
5. No smoking.
6. Ports, hatches, and doors closed.
7. Portable tanks should be refueled ashore.
8. Make certain all passengers are ashore.
9. Determine quantity of fuel required.
10. Hold hose nozzle firmly against fill pipe opening.
11. Do not overfill.
12. Wipe up all spillage.
13. Open ports, hatches, and doors to ventilate.
14. Turn blower on for four minutes minimum.
15. Do the sniff test.
16. Start engine(s).
17. Re-board Passengers.
18. Untie from dock and cast off.

Note: For 2-Cycle engines that are not oil injected, fueling involves the mixing of 2-Cycle oil with the gas. Modern 2- Cycle oils are formulated to mix readily with gas. Pour oil into the tank or filler pipe first, this will allow the fuel to mix with the oil as it's being added. If using portable tanks, shaking the tank is not necessary.

Fuel Management- Practice the "One-Third Rule" by using one-third of the fuel going out, one-third to get back and one-third in reserve.

Fuel Conservation Tips

- Keep engine well tuned
- Use correct propeller and check for damage.
- Be sure engine is adequate for boat.
- Use proper oil mix in motor.
- Keep hull clean to reduce friction
- Drain all water before leaving dock.
- Distribute weight evenly and don't overload.
- Shut off engine when at dock or at rest.
- Make fewer turns so as to not increase motor load.
- Plane smoothly and quickly at take off then throttle back to cruising speed.
- Plan fishing spots ahead of time and use trolling motor for minor changes in location.

TROUBLESHOOTING

Eliminate simple problems first and work towards the complex. Remember the basics: Spark, Fuel, Air.

General:

1. Spark

- Battery switch- on
- Kill switch- on
- Shift lever- neutral detent
- Battery leads- tight and corrosion free, both ends
- Plug wires- on, tight
- Spark plug- gap correct; corrosion, fouling free
- Coil/exciter- tight

2. Fuel

- Quantity
- Prime bulb- firm
- Vent- open
- Hose, Bulb- not cracked, leaking
- Fuel line- clear, and fuel valve (if any) open
- Fuel filter- unclogged
- Fuel quality- use fuel treatment if water in fuel

3. Air

- Air cleaner- clean
- Carburetor adjustment- only if skilled

Operational Problems:

1. **Engine hard to start or will not start** (*Engines are more likely not to start than to quit while running*)
 - Empty gas tank
 - Gas tank air vent closed
 - Fuel line kinked, clogged, not attached
 - Water or dirt in system
 - Motor must be choked or primed
 - Carburetor adjusted too lean
 - Ignition timing off
 - Choke linkage bent or out of adjustment

2. **Low speed miss**

- Too much or too little oil
- Ignition timing
- Carburetor
- Weak coil
- Loose or broken ignition wires

3. **High speed miss**

- Bad spark plugs
- Loose or broken ignition wires
- Weak coil
- Water in fuel

4. **Runs well for a while and then quits**

- Weeds or other debris on prop
- Insufficient cooling water
- Carburetor, fuel pump, filters or screens dirty
- Lower unit bind (lack of lube, or bent)

5. **Motor overheats**

- Motor not deep enough in water
- Not enough oil in gas
- Plugged water inlet/outlet
- Obstruction in water passages

6. **Engine runs well but lacks power while underway**

- Improper mounting
- Incorrect tilt angle or improper load distribution
- Fouled propeller or lower unit
- Damaged propeller blades or bushing assembly
- Shear pin or bushing may be stripped

7. **Engine Knock**

- Loose propeller
- Loose fly wheel nut
- Worn bearings, worn pistons, or by a broken engine mount spring

Generally, if not readily remedied by tightening prop or flywheel, take it to a dealer.

8. **Electric starter inoperative**

- Loose or corroded connections, no ground
- Starter circuit safety switch open
- Weak battery
- Faulty solenoid

9. **Electric starter won't engage, solenoid clicks**

- Loose or corroded connections, no ground
- Weak battery
- Faulty solenoid (turn off ignition, engage manually, then turn on ignition)
- Broken wire in harness
- Loose or stripped post on starter

PRE-DEPARTURE CHECK LIST	
Personal Flotation Devices (PFDs)	
	At least one Coast Guard approved device per passenger and a minimum of two on board.
	An additional throwable device is required if the vessel is more than 16 feet long.
	Explain the location and use of all PFDs to passengers and crew that may be new to the vessel.
Sound Producing Devices (Whistle)	
	Must have a horn capable of producing a four-second blast audible for at least 1/2 mile.
	If a portable air horn, have a spare can of air or an alternate device.
Lights and Shapes	
	All navigation lights as required.
	Instrumental lights working.
	If you intend to engage in an activity that requires a day shape, have the required shapes.
	Flashlight on-board.
Distress Signals	
	Accessible flares, day signals, etc., stored in a dry location. Carry signals at all times even if not required by the Coast Guard.
	Inform the crew and passengers of their location and their use.
Tools and Spares	
	Basic toolbox on-board.
	Box of spares aboard, e.g., fuel filter, light bulbs, head parts, through hull plugs, etc.
Ventilation	
	On any powered vessel or auxiliary powered sailboat, or vessels using LPG for cooking or heat, check that all interior spaces are well ventilated before departure.
	If fuel smells are detected before ventilating, check after running the blowers for several minutes
	If odor persists, stop and look for the source of the leak.
Fire Extinguishers	
	Accessible fire extinguisher. Do you have at least those required by the U.S.C.G.?
	Check to be sure mounts are secure and functional before departure.
	Take the time to point out locations to passengers and crew.
Fuel and Oil	
	Are your tanks topped-off?
	If not, have enough fuel to provide a reasonable margin of safety for your return.
	Check the engine oil and coolant level.
Bilges	
	Check to be sure bilges are reasonably dry and that pumps are not running excessively.
	Clean up any spilled oil or waste in bilges so as to prevent overboard discharge.
Battery Care	
	If you have a dual charging system, is the selector switch in the proper position?
	Is the power on to the entire vessel?
	Spare batteries for accessories such as a handheld radio, flashlight, portable navigational aid, etc.
	If they are rechargeable, are they charged?
Weather Forecast	
	Did you check the weather forecast?
	Radio on board to receive weather updates.
Docking and Anchoring	
	At least one anchor set up and bent-on to your anchor line.
	Two or three extra dock lines in case of unusual conditions dockside.
	Visually inspect the lines you use for chafe or wear.
	At least two fenders on-board for docking or towing if required.
Documentation	
	Have the ship's papers, radio license, fishing permit, etc. on board.
	Have chart or charts for the area you intend to cruise in, regardless of your level of local knowledge.

FLOAT PLAN - File with a responsible adult

Owner's Name		Propulsion	Outboard I/O Inboard
Address			Single Screw Twin Screw
Boat Name		Engine Type	Outboard Gas I/O & Inbd. Gas Diesel
Boat Type/ Length		Departure/ Destination Points	
Boat Color		Route	
Safety Equip. (Beyond Req.)			
Expected Return Date & Time		Date/Time to call search Phone# of Local U.S.C.G. Station	
If trailering: Automobile		License Plate #	
# Persons		VHF Call	
Emergency Phone #s		Frequencies	
Person in Command		Mate	
Address		Address	
Phone		Phone	
Special Medical Concerns		Special Medical Concerns	
Crew Name		Crew Name	
Address		Address	
Phone		Phone	
Special Medical Concerns		Special Medical Concerns	

Chapter IV – Operations-Navigation

General Responsibility

- Safety of all passengers.
- Boat's wake and damage caused by it.
- Maintaining a proper lookout and a safe speed.
- Using good seamanship (making good decisions - sound judgment).

NOTE: Regardless of position and/or grade, the watercraft operator is directly responsible for the operation, maintenance and safety of the craft; the safety of all personnel aboard, and is the final authority on the watercraft. This is both a long standing tradition and grounded in maritime law.

State Specific Requirements

DOI boat operators are required by 485 DM 22 to operate according to all state and local laws as well as federal ones. It is essential that you be familiar with those regulations that differ from the standard, federal requirements presented elsewhere in the course. These may include:

- Definitions of reckless, negligent or dangerous operation.
- Safe speed.
- No-Wake zones.
- Regulations concerning standing up or on a boat less than 20 feet during other than slow-speed operation.
- Bow riding.
- Direction of operation on lakes or other impoundments.
- Minimum age of operation.
- Boating Certificate requirements.
- PFD requirements on small boats.
- Motor size limitations.
- Other

Operator Responsibility

It is the skipper's responsibility to take charge of and to ensure the safety of his crew and his passengers. This means reviewing emergency equipment and procedures. Inform your crew and passengers of the rules of safe boating and try to insure that at least one other person aboard is capable of operating the vessel in the event of an emergency. You should explain and/or demonstrate the following:

- Always have one hand for the boat and the other for yourself. Never walk around on a boat without holding on.
- Enter a small boat by stepping into the center.
- Hand equipment into the boat; do not try to carry it aboard as you enter.
- Distribute the load evenly fore and aft and from side to side.
- Check the boat's capacity plate.
- Don't overload the boat; it will reduce stability and make capsizing more likely.

Courtesy

Every one who uses or enjoys the waterways of our country whether boating, walking along the shoreline or actually living on the water's edge, has the same rights to enjoy the tranquillity of the water. Boaters should respect the rights of others who live or play on the shoreline. You should not disturb private property owners by docking on their land. You should be careful of the amount of wake that you are leaving when operating close to shore. You are responsible for any damage you cause with your wake. Control your speed and obey speed limit signs.

Because sound carries farther over water than land, especially at night, you should keep voices; music and other noises to a minimum if anchored near a waterfront property.

Control your waste.

Pollution laws prohibit throwing refuse into the water. Carry bags aboard and dispose of waste and garbage properly. If you see floating refuse in the water, take the time to pick it up and dispose of it upon returning to shore. Many bodies of water have no-discharge regulations in effect. Check with state/local authorities regarding specific pollution regulations in effect in the area you plan to boat.

Careless, reckless, or negligent operation

It is also the responsibility of the operator to refrain from careless, reckless, or negligent operations on the water. Failure to operate a boat in a safe manner could endanger life, or property of other persons. Again, be courteous and exercise caution.

The best way to become a safe and diligent boater is to use common sense. If it doesn't make sense to do something on land it probably doesn't make sense to do it on the water. Would you ride on the hood of your car or hang out of the window when underway? Of course not that wouldn't be safe. So don't allow passengers to ride or sit on the bow, stern or sides of the boat while underway.

State and local regulations determine how close to shore, a swimming area or other vessels you can operate. You should be aware of, and obey, speed limits and no-wake zones. Check state/local laws for these regulations prior to boating on an unfamiliar body of water.

Navigation Rules



The "Rules of the Road" or Collision Avoidance Regulations (COLREGS) were designed to give direction to vessels in order to set a standard that everyone could follow in order to prevent collisions of two or more vessels. They are many in number and cover almost every imaginable sequence of events that may lead to collision. You do not have to memorize them all but be aware of the basic rules which apply in order to operate safely on the water. You will be using terms when dealing with the rules of the road that may be unfamiliar to you. Because the rules are federal laws, the definitions of these terms are important. The following terms are found throughout the rules of the road. You should have a thorough understanding of their meaning.

- **Vessel** - Every craft of any description used or capable of being used on the water.
- **Power Driven Vessel (Motorboat)** - Any vessel propelled by machinery.
- **Sailing Vessel** - Any vessel under sail alone with no mechanical means of propulsion. (A sailboat propelled by machinery is a Motorboat.)
- **Underway** - Not at anchor, aground or attached to the dock or shore.
- **Danger Zone** - An arc of 112.5 degrees measured from dead ahead to just aft of the starboard beam.
- **Right-of-way** - The right and duty to maintain course and speed.
- **Stand-On Vessel** - The vessel that has the right-of-way.
- **Give-Way Vessel** - The vessel that must keep clear of the stand-on vessel.
- **Visible** (when applied to lights) - Visible on a dark, clear night.
- **Short Blast** - A blast of approximately one-second duration.
- **Prolonged Blast** - A blast of four to six seconds duration.

Good Seamanship

Practicing the art of good seamanship is a talent that is developed over time by acquiring knowledge and skills. You must keep safety foremost in your mind when operating your boat. Do what you can to stay out of the way of other boats and always proceed at a safe speed. Safe speed means taking into consideration the current operating conditions and your own level of skill and experience.

Most specific speed regulations are local ordinances or state laws. Many states have speed and distance regulations that determine how close you can operate to other vessels, the shoreline or docking area, and swimming areas. For example, some state regulations require that you maintain a no-wake speed when within 250 feet of shore or when within 100 feet of another vessel. Be sure to check with state and local authorities to determine what regulations apply to you.

Proper Lookout

The rules are very specific about maintaining a proper lookout. We must keep eyes and ears open to observe or hear something that may endanger someone or affect their safety. You must look up for bridge clearances and power lines, down for floats, swimmers, logs and divers flags and side to side for traffic prior to turning your boat. A proper lookout can avoid surprises.

A good rule to follow is to assign one or more people to have no other assigned responsibilities except the task of lookout. They can then rotate the lookout duty.

Sound Signals

Vessels are required to sound signals any time that they are in close quarters and risk of collision exists. The following signals are the only ones to be used to signal a vessel's intentions (inland rules only).

- **One short blast** - I intend to change course to starboard.
- **Two short blasts** - I intend to change course to port.
- **Three short blasts** - I am operating astern propulsion (backing up).
- **Five or more short and rapid blasts** - Danger or doubt signal (I don't understand your intent)

Note: Inland rules use sound signals to indicate intent to maneuver. In international rules the signals are given when the maneuver is being executed.

Vessels indicate their intention to maneuver by using sound signals. Do not respond with a signal other than agreement or danger. If you do not agree with or understand clearly what the other vessel's intentions are you should sound the danger or doubt signal. Each vessel should then slow or stop until signals for safe passing are sounded, understood and agreed to.

The danger or doubt signal can also be used to tell another vessel that its action is dangerous. If a boat were backing up into an obstruction you would sound the danger signal to warn the operator.

Rules of the Road

The most common type of boating accident is collision with another vessel, usually due to improper lookout. Seafaring nations have worked together since the 1840's to create and adopt rules and regulations to prevent collisions at sea. The resulting Navigation Rules establish right-of-way procedures for the water just as highway traffic laws do for the road.

These rules were all developed to address real world accidents involving loss of life and property throughout maritime history. They constantly stress the notion of individual responsibility to know the Rules and apply them consistently. It should also be remembered that the operator or "master" of the vessel is ultimately responsible for all actions taken, or not taken, in any given situation. The master of the vessel is "in command", regardless of the rank of any on board. The vessel and the safety of all on board are the master's responsibility.

The Navigation Rules establish actions to be taken by vessels to avoid collision. The Rules are divided into two parts, **INLAND and INTERNATIONAL**. Inland Rules apply to vessels operating inside the line of demarcation while International apply outside. Demarcation lines are printed on most navigational charts and are published in the Navigation Rules.

The operator of a vessel 12 meters (39' 4") or greater is responsible for having on board and maintaining a copy of the **Inland navigation rules (COLREGS)**.

The following definitions, discussions and diagrams describe the whistle signals and action to be taken by vessels in a crossing, meeting or overtaking situation while operating in Inland Waters. These are basic examples, for further information consult the **"NAVIGATION RULES"** International-Inland (Commandant Instruction M16672.2D Series)

- **Responsibility Rule (Rule 2)**- This rule is actually divided into two complementary parts, which taken together tell us to avoid collision no matter who is in the right and what we have to do. They are known as:
 - **Good Seamanship Rule (Rule 2a)**- "Nothing in these Rules shall exonerate any vessel, owner, master, or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case." Essentially this is telling us to do everything possible to avoid collision.
 - **General Prudential Rule (Rule 2b)**- "...due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger." In this Rule we are told that in unusual circumstances we may take any steps necessary, including breaking the rules, to eliminate the risk of collision. However, the permission to depart from the rules is temporary, lasting only as long as the emergency.
- **Look-out (Rule 5)**- "Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision." If the boat is equipped with radar, it must be in use, and does not substitute for a posted crewperson as lookout. Most recreational boats do not "post" a lookout, but courts have ruled that the lookout must be a trained seaman with no other duties. While the Rules do not prohibit single handed or short-handed sailing, in the event of a collision the burden of proof is on the operator to establish that a "proper look-out" could not have prevented the occurrence.
- **Safe Speed (Rule 6)**- "Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions..." Several factors determine what a "safe" speed is:
 - Visibility
 - Traffic density
 - Maneuverability of the vessel
 - Sea conditions
 - Draft of vessel
 - Other environmental factors
- **Risk of Collision (Rule 7)**- "Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt, such risk shall be deemed to exist..." This rule also requires the use of radar, if available and operational, to aid in a determination. It also points out specific circumstances that should be considered:
 - The compass bearing of an approaching vessel remains constant- risk is deemed to exist.
 - An appreciable bearing change is evident, but the vessel is very large, or at close range- risk may exist.
 - A constant bearing and decreasing range is always a "risk of collision".
- **Action to Avoid Collision (Rule 8)**- "Any action taken to avoid collision shall...be positive, made in ample time and with due regard to the observance of good seamanship...alteration in course or speed to avoid collision shall...be large enough to be readily apparent to another vessel observing visually or by radar...effectiveness of the

action shall be carefully checked until the other vessel is finally past and clear...if necessary...a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion...". Once risk of collision exists the Navigation Rules come into play. It is necessary to assign each vessel a role:

- **Give-way Vessel-** This vessel does not have the right-of-way, and according to Rule 16, must "...take early and substantial action to keep well clear."
 - **Stand-on Vessel-** This vessel has the right-of-way, and is obligated by Rule 17 to "...keep her course and speed...", however in the event the Give-way vessel fails to take appropriate action and collision cannot be avoided by the actions of that vessel, the Stand-on vessel "...shall take such action as will best aid to avoid the collision..."
- **Overtaking (Rule 13)-** "...any vessel overtaking any other shall keep out of the way of the vessel being overtaken..." The rule further defines the situation by making reference to the vessels aspect at night while viewing its navigational lights. It refers to being able to see only the stern light, and neither of the sidelights of the vessel being overtaken. Key points of this situation area:
 - A vessel is being overtaken if you are within the Arc of visibility of its stern light only (135 degrees across the stern).
 - Vessel being overtaken is the stand-on vessel.
 - The overtaking, give-way vessel, is required to sound whistle signals to indicate how it proposes to pass the other vessel.

NOTE: As an overtaking vessel goes around the other vessel it will pass from the "overtaking" zone into the "crossing" zone. This does not change the situation. The overtaking vessel remains obligated to complete the maneuver, keeping clear of the other vessel until past and clear.

- **Head-on Situation (Rule 14)-** "When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve the risk of collision each shall alter course to starboard so that each shall pass on the port side of the other...". The Rule states that risk of collision is deemed to exist when a vessel sees the other ahead or nearly ahead and by night would have seen either the masthead lights of the other in line or nearly so, and/or both sidelights. The situation is summarized as follows:
 - A meeting situation exists if you are in the arc of visibility of both its sidelights, and/or its masthead lights are in line or nearly so.
 - Neither vessel has the right-of-way.
 - Whistle signals are required, either can initiate.
 - May pass port to port when both agree after exchanging proper signals.

However, vessels may pass starboard to starboard if proper signals are given.

NOTE: The rule does not apply to two vessels that will pass clear of each other if each maintains course and speed.

- **Crossing Situation (Rule 15)-** "When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel...". You can determine this situation by default in that if risk of collision exists and you're not meeting or overtaking, you are crossing. Another way to determine it is to visualize the lights on the other vessel. If you would be seeing either sidelight only, it is a crossing situation.
 - A crossing situation exists if you are within the arc of visibility of either sidelight of the other vessel.
 - The give-way vessel is the one that "sees red", or in other words, has the other vessel to its starboard side (hence, sees the other vessels red sidelight).
 - The stand-on vessel should initiate whistle signals to propose action.

- **Responsibility Between Vessels (Rule 18)**- The Nav Rules are written with the understanding that not all boats can maneuver with the same ease. Therefore, Rule 18 states that certain vessels have the right-of-way over other vessels by virtue of their ability to maneuver. In order to accommodate these differences a sort of "pecking order" has been devised such that a listed vessel must give-way to higher-listed vessels and is the stand-on vessel to lower-listed vessels:
 - **Vessel not under command**- vessel unable to maneuver e.g. broken rudder, engine failure, adrift.
 - **Vessel restricted in her ability to maneuver**- due to nature of work, restricted in ability to maneuver, e.g. Cable laying; dredging; underwater operations etc.
 - **Vessel engaged in fishing**- fishing with nets, lines, trawls, or other fishing apparatus that restricts maneuverability, not including vessels trolling lines or other fishing apparatus that do not restrict maneuverability e.g. shrimp trawler w/nets out.
 - **Sailing vessel**- vessel under sail, not propelled by machinery if present. (Note: when a sailboat has its motor running, it is considered a power-driven vessel).
 - **Power-driven vessel**- vessel propelled by machinery.
 - **Seaplane**

Each of these vessels must keep out of the way of the next vessel in the hierarchy. For example, a sailboat must keep out of the way of a vessel engaged in fishing, which in turn must keep out of the way of a vessel with restricted maneuverability. And everyone must keep out of the way of a vessel not under command.

NOTE: This rule is modified in cases where other Rules are in effect: Narrow Channels, Rule 9; Traffic Separation Schemes, Rule 10; and Overtaking, Rule 13.

- **Maneuvering and Warning Signals (Rule 34)**- The Rules tell us what to do in a given situation and provide a means to communicate it to others in the area. In fact, they go so far as to tell us we must communicate. The minimum signal acceptable is a sound signal using a whistle, but can be augmented by flashing lights. Under Inland Rules, the signals are ones of **INTENT**. The initiator is telling the other vessel what s/he intends to do. It is customary that the stand-on vessel initiates most signals, with the exception of situations where the Rules designate who initiates (e.g. Overtaking). An excerpt from the Rule illustrates how specific it is: "When power-driven vessels are in sight of one another and meeting or crossing at a distance within a half a mile of each other, each vessel underway, when maneuvering as authorized or required...shall indicate that maneuver by ...signals on her whistle..." Additionally the other vessel, if in agreement must "sound the same sound signal..." to indicate agreement. If the vessel does not agree it must "sound the danger signal..." and both are responsible to "...take appropriate precautionary action until a safe passing agreement is made...". The signals prescribed in the Rules are:
 - One short blast- I intend to leave you on my port side.
 - Two short blasts- I intend to leave you on my starboard side.
 - Three short blasts- I am operating astern propulsion.
 - Five short blasts- Danger, I don't understand your signal, or am in doubt that sufficient action is being taken to avoid collision.
 - One prolonged blast- Obstructed vision signal, used for "blind bends" or leaving a dock or berth.
 - One prolonged blast, every two minutes- Restricted visibility signal used in day or night, i.e. fog.

Meeting Situations

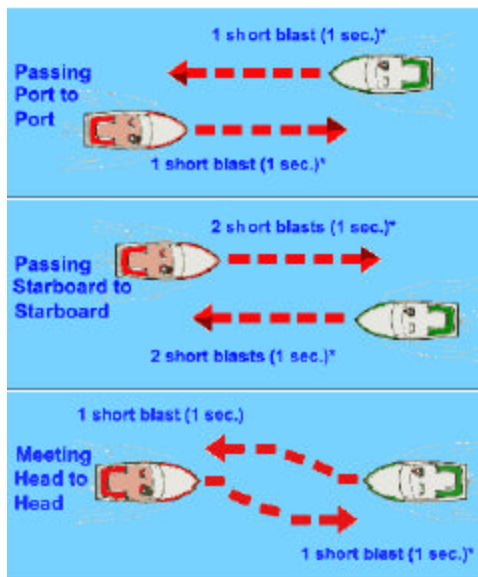
In the following situations, the give-way vessel must take action to keep well clear. The stand-on vessel should maintain its course and speed. If it becomes apparent that the actions taken

(or not taken) by the give-way vessel are dangerous or insufficient, you should take action to avoid collision.

Meeting Head-On

When two power-driven vessels are approaching head-on or nearly so, either vessel should indicate its intent, which the other vessel should answer promptly. In a meeting situation neither vessel is the stand-on vessel.

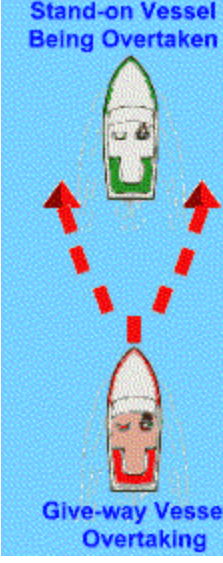
It is generally accepted that you should alter course to starboard and pass port-to-port. The accompanying sound signal is one short blast. If you cannot pass port-to-port due to an obstruction or other vessels, you should sound two short blasts to indicate your intention to pass starboard-to-starboard. Make sure the other vessel understands your intent before proceeding. The other vessel should return your two-short-blast signal.



Overtaking

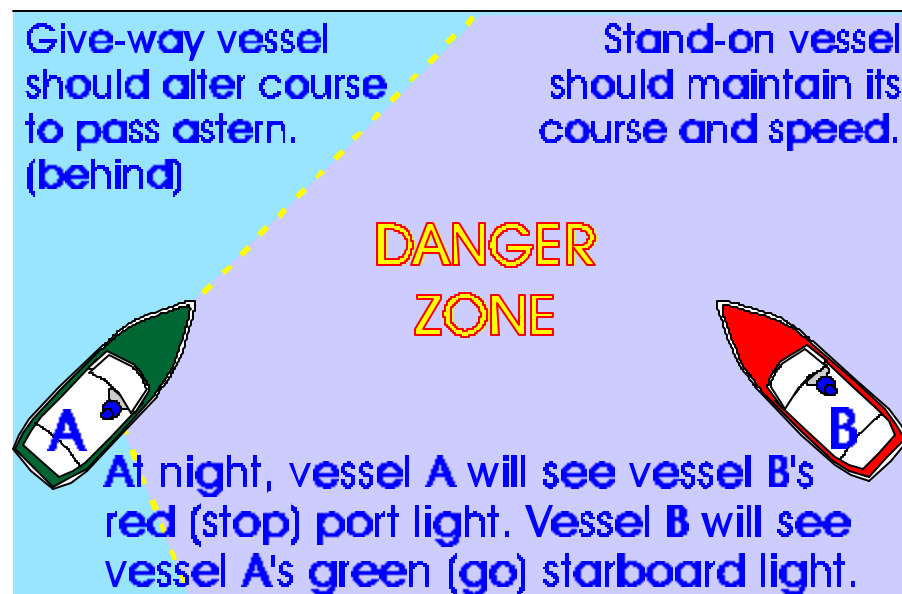
When two vessels are moving in the same direction and the astern vessel wishes to pass, it must initiate the signal to pass as shown in the diagram. The vessel passing is the give-way vessel and should keep out of the way of the vessel being passed. The vessel being passed is the stand-on vessel and should maintain its course and speed. If the stand-on vessel realizes that the course intended by the give-way vessel is not safe, it should sound the danger or doubt signal.

If you are the overtaking vessel, remember that you are the give-way vessel until well past, and safely clear of, the passed vessel. Do not cut in front, impede or endanger another vessel.

<p>Inland Rules "I intend to pass you on your port side" 2 short blasts (1 sec.)</p> <p>"Agreement" 2 short blasts (1 sec.)</p> <p>International Rules: "I intend to pass you on your port side" 2 prolonged blasts/2 short</p> <p>"Agreement" 1 prolonged/1 short/1 prolonged/1 short</p>		<p>Inland Rules "I intend to pass you on your starboard side" 1 short blast (1 sec.)</p> <p>"Agreement" 1 short blast (1 sec.)</p> <p>International Rules: "I intend to pass you on your starboard side" 2 prolonged blasts/1 short</p> <p>"Agreement" 1 prolonged/1 short/1 prolonged/1 short</p>
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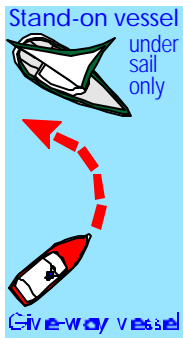
Crossing

When two power-driven vessels are approaching at right angles or nearly so, and risk of collision exists, the vessel on the right (to starboard) is the stand-on vessel and must hold its course and speed. The other vessel, the give-way vessel, shall maneuver to keep clear of the stand-on vessel and shall pass it by its stern. If necessary, slow or stop or reverse until the stand-on vessel is clear.



In the example above, the green vessel is the give-way vessel and should alter course and speed to pass behind the red vessel. If the skipper of the red vessel does not observe the green vessel taking action to avoid collision, then he/she must take the required action to avoid a collision.

Sailing Craft and Boats Propelled by Oars or Paddles



Sailing craft and boats propelled by oars or paddles have the right-of-way over power driven vessels. An exception to this is if the sailing craft or self-propelled vessel is passing a power driven vessel. In an overtaking situation, the overtaking vessel is the give-way vessel, even if it is not propelled by an engine. Sailing vessels have special situations when meeting and crossing each other.

Navigating Narrow Channels

The rules tell you to stay to the starboard side of narrow channels. Make sure that you do not impede a vessel that is constrained by draft, i.e. a large vessel that must operate within the channel in order to make way safely. When crossing a channel, do so at a right angle and in such a way as to avoid causing the traffic in the channel to make course or speed changes. Do not anchor in a channel unless you cannot make way (broken down, etc.).

When operating on the Great Lakes, Western Rivers and other designated rivers, the downbound vessel (going with the current) has the right of way over a vessel going upstream. This is because a vessel going upstream can maneuver better than a vessel going downstream.

If you approach a bend in a river around which you cannot see, sound one prolonged blast to alert vessels approaching from the other side of the bend that you are there. If another vessel is around the bend, it should answer with one prolonged blast. Conversely, if you hear a prolonged blast as you approach the bend, answer with a prolonged blast.

Commercial Vessel Situations

If at all possible stay out of areas where there is commercial vessel traffic such as shipping lanes or traffic separation zones. Large ships and barges have special problems in maneuvering and **cannot and will not get out of your way.**

If you must operate around commercial vessels take heed of the following:

- Avoid ship channels. If you must cross do so at right angles and as quickly as possible.
- Be alert. Watch for traffic.
- Be seen, especially at night.
- Know the sound signals, especially the danger or doubt signal.
- Keep your VHF radio tuned to channel 16 and listen carefully.
- Order all aboard to wear PFDs.
- Be familiar with the area and have current navigation charts.

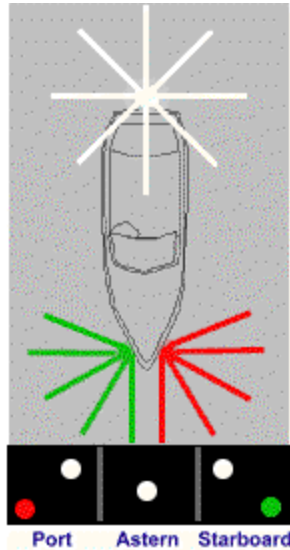
Restricted Visibility

When operating at night, or other times of restricted visibility, the required navigation lights, as set forth in the required equipment section are mandatory to be displayed. The lights themselves will let each vessel know which is the stand-on or give-way vessel and each vessel should react accordingly.

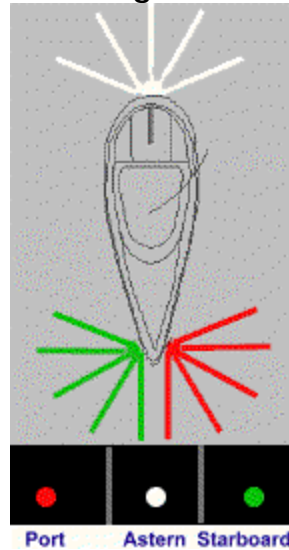
A vessel approaching in your danger zone (approaching from your starboard side) will show its red (stop) port light. That vessel will see your green (go) starboard light. If you do not see a

mast light, you know the vessel is not power-driven (or not operating under its own power, as in the case of a boat being towed) and has the right of way over power-driven vessels.

Power Driven Vessel



Sailing Vessel



During nighttime operations vision can be tricky at best, so a proper lookout and safe speed need constant attention.

During times of **restricted visibility** such as smoke or fog, additional sound signals are required. Both inland and international rules require that any vessel underway in or near a restricted visibility area sound a warning signal every two minutes.

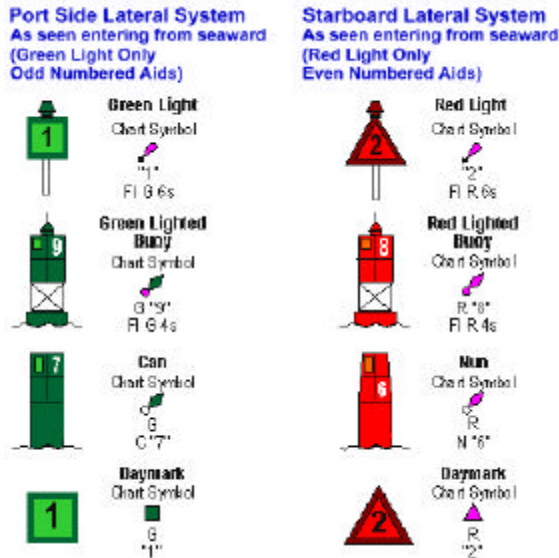
- Motorboats must sound one prolonged blast every two minutes.
- Sailing vessels must sound one prolonged blast plus two short blasts every two minutes.
- When a power driven vessel is stopped (underway but making no way) she shall sound two prolonged blasts every two minutes.
- Vessels at anchor shall sound rapid strokes on the bell for 5 seconds at intervals not less than one minute (however, if your vessel is less than 65 feet and you are anchored in a designated "special anchorage" you do not need to sound these signals).
- Vessels aground shall sound three distinct strokes on the bell ("I Am Aground"), followed by five seconds rapid ringing of the bell, followed by three distinct strokes on the bell ("I Am Aground").

	<div> <div></div> One Prolonged Blast <div>●</div> One Short Blast <div> One stroke on the Bell </div> </div>
Power Vessel Underway Every Two Minutes	<div> <div></div> </div>
Sailing Vessel Underway Every Two Minutes	<div> <div></div> <div>●</div> <div>●</div> </div>
Power Vessel Underway but making no way	<div> <div></div> <div></div> </div>
Vessel at Anchor Every Minute	<div> <div> </div> <div>5 seconds of rapid ringing</div> </div>
Vessel Aground Every Minute	<div> <div> </div> <div>3 strokes</div> <div> </div> <div>5 seconds rapid ringing</div> <div> </div> <div>3 strokes</div> </div>

Aids To Navigation

In order to find our way safely from place to place on the water we must depend on road signs just as we do on land. The aids to navigation are the road signs of the water. Learning to understand them requires experience and practice. However, the benefit to be derived in being able to navigate safely by using the system is well worth the effort.

There are two systems of marking the waterways in the United States, the U.S. Aids to Navigation System (ATONS) that includes the Western River System, and the Uniform State Waterway Marking System. Both systems are described below. You should know that the Uniform State Waterway Marking System is being phased out in favor of the U.S. ATONS. This change will be gradual and should be complete by 2003. In the meantime, you may see either system in use on state waterways.



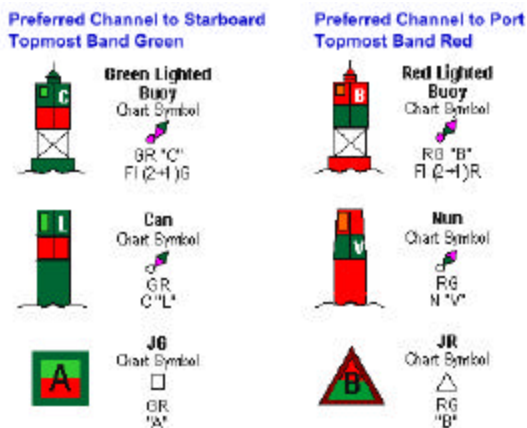
The U.S. Aids to Navigation System (U.S. ATONS)

The buoys and beacons in this system conform to the International Association of Lighthouse Authorities (IALA) guidelines and are located in IALA region B. They are sometimes referred to as the IALA-B system. In this system, there are lateral and non-lateral markers. The lateral markers indicate the navigable channel by their position, shape, coloring, numbering and light characteristics. The non-lateral markers are informational and regulatory markers.

To navigate safely using the lateral markers, you should pass between the red and green. Returning from sea, the red markers are on your right (red, right, returning) and the green are on your left.

Lateral Buoys and Waterway Markers

Navigation aids mark the edges of channels to tell where safe water is. They are called day beacons if unlighted, lights if lighted at night, or buoys if they are floating. Some buoys are also lighted for identification at night.

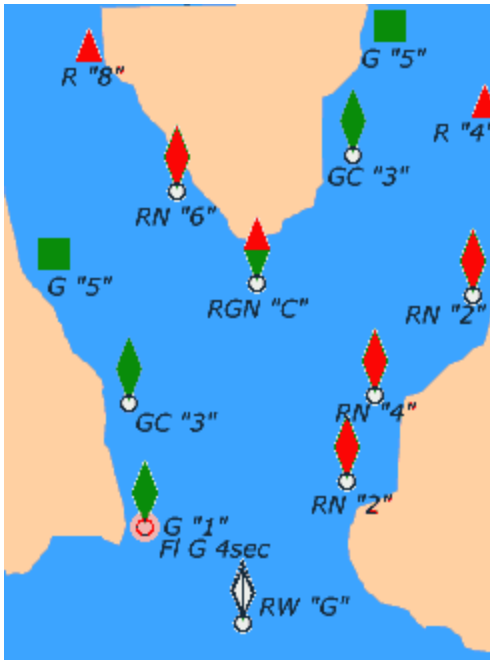


"Red, Right, Returning" tells you to leave the red markers to your right, or starboard, when returning from sea. The green markers are then left on your port side and between is the channel. Be sure to look behind you when navigating a narrow channel to make sure wind or current is not pushing you out.

Floating red markers are called nuns and are triangular in shape. They are numbered with even numbers. Floating green markers, on the other hand, are called cans and are square or shaped like a large can and carry odd numbers.

Preferred channel markers or junction markers

indicate the preferred channel at points where the waterway splits or branches off in another direction. If you are returning from sea and see a preferred channel marker that is red over green, to stay in the main channel you would consider the marker as if it were a red marker and keep it on your right. However, if your intended destination is the waterway branch consider the marker a green marker and leave to your port side. (See example above.)

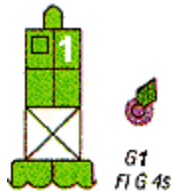


How to Read a Chart

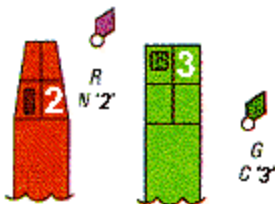
Reading the chart to left, the markers are described below as follows:



The first marker you see entering from sea is the open, or safe water, marker. The **RW "G"** means that it is a **Red** and **White** striped marker with, in this case, the letter **"G"** on it.



A lighted marker flashes at night and during restricted visibility. The next marker you see as you enter this waterway is the **G "1" FI G 4 sec**. This tells you it is **Green**, has the number **1** on it, and it **Flashes Green** once each **4 seconds**.



RN "2" plus the red symbol indicates a **Red Nun** buoy with the even number **2** on it. Conversely **GC "3"**, is a **Green Can** buoy with the odd number **3** on it.

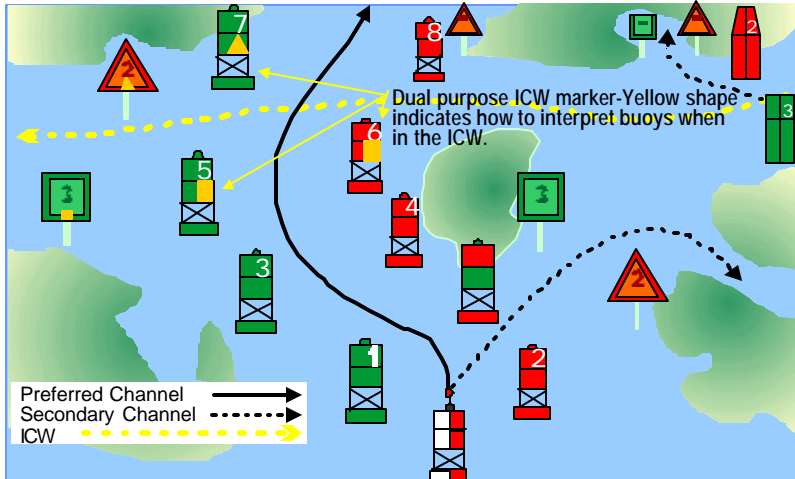


When entering from seaward you may find two channels that separate and go in different directions. A junction marker referred to as **RGN "C"** uses its top color to show you the major or primary channel. This is represented by a **Red** and **Green** **Nun** buoy with (in this case) a **"C"** on it. You use the top color and shape as if it were a stand-alone marker if you want to follow the primary channel. In this case leave the **Red Nun** to the right. Otherwise use the bottom color.

Intracoastal Waterway System

The Intracoastal Waterway (ICW) runs parallel to the Atlantic and Gulf Coasts from Manasquan Inlet on the New Jersey shore to Brownsville, Texas at the Mexican border. Aids to navigation marking these waterways have some portion of them marked with yellow. Otherwise, the colors and numbering of buoys and day marks and lights follow the same system as that observed in all other waterways.

Red, right, returning also applies to the ICW markers. However, how do you know which way is returning? **Generally** south, from New Jersey to Brownsville, Texas is considered returning. So, going **generally** south on the ICW you would have red on the right. There are some areas of the ICW such as the West Coast of Florida where you are actually going north. Still, if you are going from New Jersey to Texas you are returning.



Aids to navigation marking the Intracoastal Waterway (ICW) display unique yellow symbols to distinguish them from aids marking other waters. Yellow triangles indicate aids should be passed by keeping them on the starboard side of the vessel. Yellow squares indicate aids should be passed by keeping them on the port side of the vessel. A yellow horizontal band has no lateral significance, but simply identifies aids as marking the ICW.

Intracoastal Dual Purpose Markings

Red Buoy with yellow square -- marks left side of channel when traveling the intracoastal waterway (south), but right side of channel when coming in from sea.







Green Buoy with yellow triangle -- marks right side of channel when traveling the intracoastal waterway (south), but left side of channel when coming in from sea.

Red Buoy with yellow triangle -- marks right side of channel when traveling the intracoastal waterway (south), and right side of channel when coming in from sea.

Green Buoy with yellow square -- marks left side of the channel when traveling the intracoastal waterway (south), and left side of channel when coming in from sea.

Non-Lateral Informational and Regulatory Markers

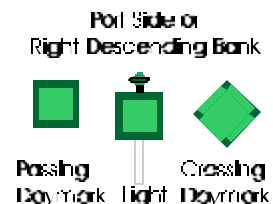
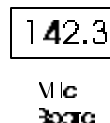
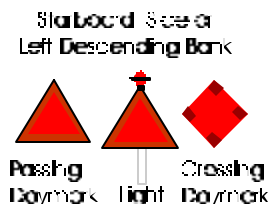
Regulatory or informational markers are used to advise you of situations, dangers, or directions. They may indicate shoals, swim areas, speed zones, etc. They can be identified by the orange bands on the top and bottom of each buoy.

 <p>Boat Exclusion Area: Explanation may be placed outside the crossed diamond shape, such as dam, rapids, swim area, etc.</p>	 <p>Danger: The nature of danger may be indicated inside the diamond shape, such as rock, wreck, shoal, dam, etc.</p>	 <p>Controlled Area: Type of control is indicated in the circle, such as slow, no wake, anchoring, etc.</p>
 <p>Information: For displaying information such as directions, distances, locations, etc</p>	 <p>Buoy used to display regulatory markers.</p>	 <p>May show white light May be lettered</p>

Western Waterway Marking System

Found only on the Mississippi River and its tributaries as defined by the U.S. Coast Guard in Rule 3 of the COLREGs. These aids to navigation are not numbered as in IALA-B system. Numbers indicate mileage from a fixed point. Lights on green aids show a single-flash that may be green or white. Lights on red aids show a group-flash that may be red or white. Diamond-shaped crossing dayboards, red or green as appropriate, are used to indicate where the river channel crosses one bank to the other.

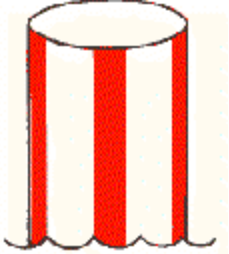

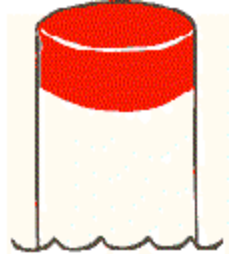
As seen entering from sea:





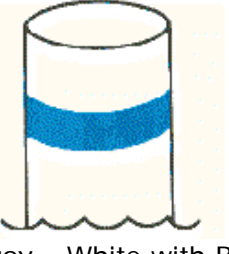
Uniform State Waterway Marking System

On bodies of water wholly within state boundaries and not navigable to the sea, each state is responsible for establishing and maintaining aids to navigation. A uniform system of aids and regulatory markers has been agreed to by all states. (Again, please note that this system is being phased out and will be replaced by the U.S. ATONS system described above. Completion of this system is anticipated by 2003.

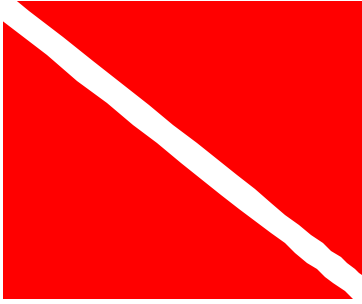
State Waterway Cardinal System (single buoys - refer to direction)

		
Red-Striped White Buoy	Black-Topped White Buoy	Red-Topped White Buoy
May Show White Reflector or Light		
May Be Lettered	May Be Numbered	
Do not pass between buoy and nearest shore	Pass to north or east of buoy	Pass to south or west of buoy
Will be replaced by an isolated danger marker. Red/white striped buoy will mean safe water as in the U.S. ATONS	Will be replaced	Will be replaced

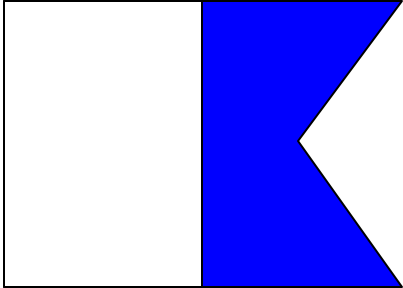
State Waterway Lateral System (paired buoys - marking channels and rivers)

	Solid Red and Solid Black Buoys Usually found in pairs. Pass between these buoys Looking upstream red is to the right	
May show green reflector or light - Buoy may be green Will be green		May show red reflector or light
		
Mooring Buoy - White with Blue Band May show white reflector or light		

Some informational/warning flags you might see include:



Divers' Flag indicates that scuba divers or snorkelers are operating in the area. Stay well clear of this flag. Many states have specific distance-away requirements from 100 to 300 feet. Check your state regulations.



Rigid Alpha Flag is flown by a vessel engaged in diving operations. This flag does not substitute for the diver-down flag above in states that require the diver-down flag. You will usually see both flags in use. The alpha flag indicates that the vessel is restricted in ability to maneuver, in this case due to the nature of its work.

Chapter V - Getting Underway

Getting Underway

Getting underway for the first time can be a stressful experience. However, with lots of pre-planning, passenger orientation and preparation, stress can be kept at a minimum and a safe voyage can be expected.

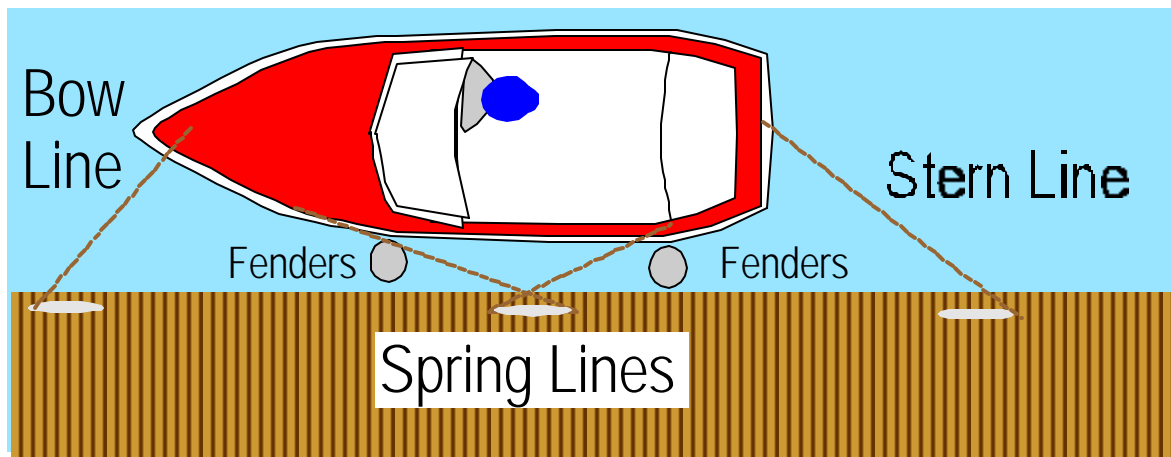
Boarding- Stability is a safety issue; wearing a PFD is critical.

- Secure boat.
- Keep body low.
- Keep weight centered.
- Load items into boat one at a time, handing items to person already in boat (avoid throwing).
- Secure load.

Boat trim- This is the way a boat floats, and is vital in a small boat. It is influenced primarily by weight distribution, and secondarily by trim controls on boats that have them.

- Distribute the weight in the boat (keep the bow light).
- Avoid sudden sharp turns.
- Never exceed boat's capacity.

Once the boat has been checked out, passengers and equipment are aboard, and the engine has been started and has been allowed to run until it has come to operating temperature, you are ready to cast off. But before casting off let's take a look at how to tie and untie the boat properly.



Line Handling and Marlinespike

When aboard a boat ropes are no longer called ropes, they are called lines. At least three and preferably four lines should be carried aboard for docking. A bowline to secure the bow; a stern line to secure the stern, and at least one spring line to reduce fore-and-aft movement. The diagram below shows four lines used. Although the stern line will keep the boat from moving forward too much, to be safe a fourth spring line running from the dock cleat forward could be used.

Marlinespike

Marlinespike seamanship includes not only knot tying, but also the whole subject of rope and line as used in the seafaring profession. Humans have been tying knots and using ropes since before recorded history.

Rope is "rope" when it is being manufactured and stocked in the store. Sailors refer to "rope" as "line" once it has been acquired for use on a boat. Specifically, a line takes its name from the purpose it will serve (IE. mooring line, bow line, spring line).

Lines are made from a variety of materials ranging from wire strands to fibers of many kinds. The choice of which to use is dependent on the use it will be put to. Obviously wire provides the best strength-to-size ratio, but is difficult to work with. Fiber lines are the most common around boats. Each fiber has different properties that determine their usage.

Lines are constructed in different ways, the most common being the three-strand or "laid" rope. It is made by twisting and re-twisting the fibers together. Ultimately the main strands are twisted in a clockwise or "right-hand" lay as seen with the end held away from you. Another common type of line is braided line that is made as the name suggests by braiding fibers together. It can be found as single or double braided, which refers to the presence or absence of a braided core.

Materials

- Hemp- relatively strong but deteriorates quickly.
- Cotton- weak, deteriorates quickly.
- Nylon- very strong, elastic, good for dock and anchor lines.
- High Intensity Fiber (Dacron, Duron, A.C.E.)- very strong, very static, good for running rigging.
- Kevlar- very strong (high tensile strength, low shear strength), static, expensive, used in competition sailing.
- Polypropylene- strong, cheap, floats, harder to tie, susceptible to sunlight.

Line Selection- The choice of a line type will depend on a combination of factors:

- Intended use of a line
- Exposure to corrosives
- Strength- should be able to hold 5X the expected load.
- Weight of line.
- Diameter of line- line smaller than 3/8 inch is hard to hold by hand under load.
- Impact resistance
- Stretch or elongation
- UV exposure
- Floatation
- Abrasion resistance

Line Size

Small stuff: <1/4" good for hanging gear up

5/16"-7/16": general use

1/2": general use on boats under 16'

9/16"-5/8": general use on boats 16-40' and anchor lines for boats up to 40'

Rope and Fiber Comparison Chart				
	Manilla	Nylon	Dacron	Polypropylene
Relative Strength	1	4	3	2
Relative Weight	3	2	4	1
Elongation	1	4	2	3
Resistance to Impact loads	1	4	2	3
Mildew/Rot Resistance	1	4	4	4
Acid Resistance	1	2	2	4
Alkali Resistance	1	4	4	4
Sunlight Resistance	2	2	3	2
Organic Solvent Resistance	3	3	3	2
Melting Point	380F	410F	410F	300F
Floatability	Only when new	None	None	Indefinite
Relative Abrasion Resistance*	2	3	4	1
* Depends on many factors (whether wet or dry, etc)				

Line Care

- never put a strain on a kinked line
- keep line clean
- guard against chafe and abrasion
- never overload lines
- keep chemicals off lines
- finish the ends of lines to prevent fraying
- don't stand on lines
- store properly

Stowage

- **In-Use**
 - coiled/hanging
 - faking/running
- **Not in-use**
 - coiled/hanging
 - stuffed (sack)
 - rope locker
- **Terminology**
 - Running or Bitter end
 - Standing part
 - Bight

Knots

The choice of a knot to use for a given task is dependent on factors such as: strength of the knot; ability to remain tied under load, or when unloaded; size of line; speed in tying; ability to be untied after loading; and others.

The following table lists the properties and uses of the required knots:

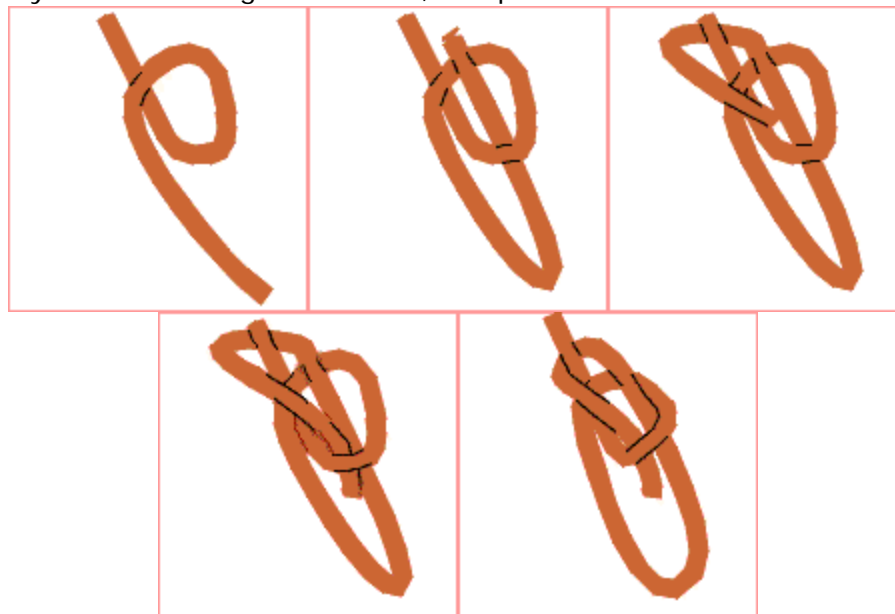
Knots and Strength of Line		
Knots/bends/hitches	% Retained Strength	Common Uses
Square Knot	43-47**	join similar size lines
Clove Hitch	60	tie to piling w/1/2 hitch
Figure 8		stopper knot won't jam
Bowline	67-75	all around, won't jam
Sheet Bend	48-58*	join different size lines
Anchor Bend (Round Turn W/Half Hitches)	76	quick fastening; securing to anchor chain ring
*Smaller sizes of nylon are likely to slip without breaking		
**Both nylon and combination ropes in smaller sizes are liable to slip		

There are five basic knots that every boater should know. All knots used by boaters are designed to be easy to tie, take a tremendous amount of strain and then be easy to untie.

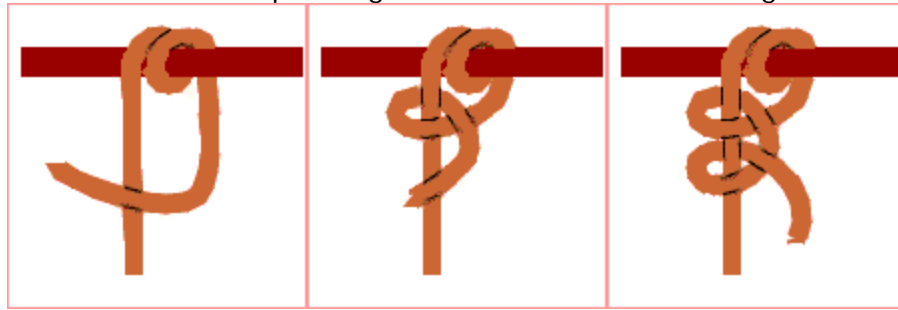
The five knots are as follows, and you should practice until you can tie them without thinking about it.

Bowline - Also called the "king" of knots, the bowline is very versatile. It is used to form a temporary loop in a line that may then be put over a piling or cleat. It can also be used to attach a line to an eye. This knot won't slip or jam.

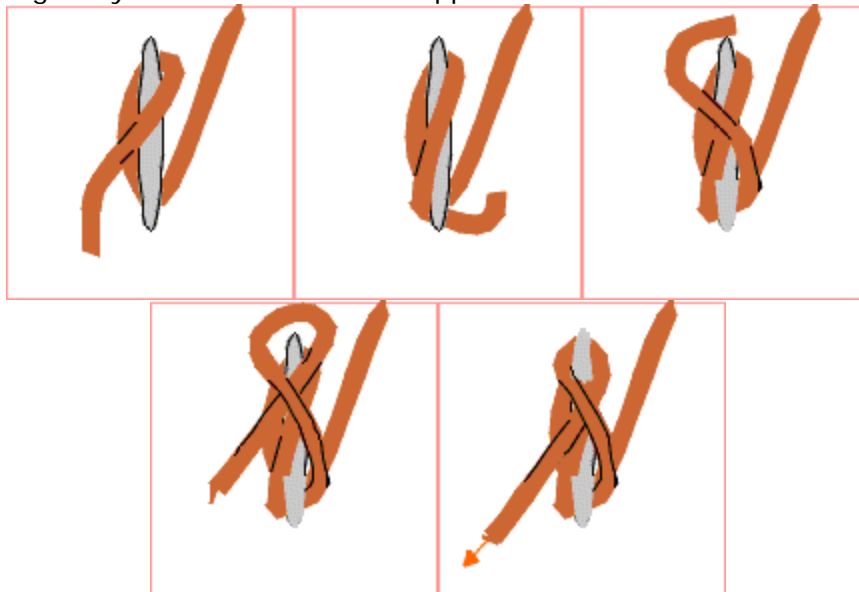
Start by making an overhand loop that looks like a six (see first figure). With the end of the line, come up through the hole in the six, around the back of the line you're holding and back down through the hole in the six. Grab the part of the line that went up through the hole and the part of the line that came back down through the hole in one hand, and the top of the line you were holding in the other, and pull.



Anchor Bend (Round turn with half hitches) - Used to permanently tie to a piling, mooring or ring. Simply take a full turn around the object being tied to and take two half hitches around the line itself. Over and up through and under and down through.



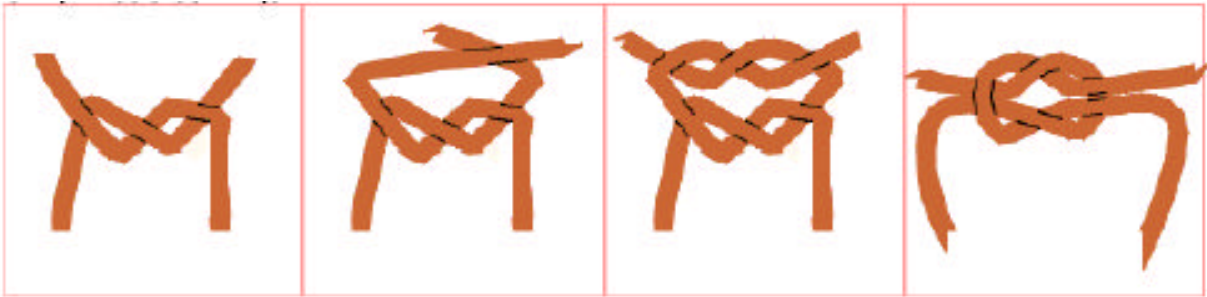
Cleat Hitch - In order to secure the boat to a dock or secure a line to the boat you will probably use the cleat hitch. Take the line to the ear of the cleat furthest from where the line comes from (the load). Take one wrap around the base of the cleat and then start a figure eight across the top of the opposite ear. Finish with a half hitch turned under so that the line is coming away from the cleat in the opposite direction from which it came in.



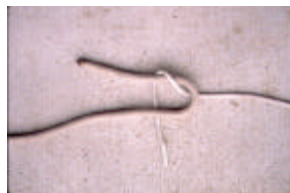
Clove Hitch - Used to temporarily tie to a piling this knot can come loose. You may add a couple of half hitches as above to make it more permanent. This knot is simply two loops with an end tucked under.



Square knot (reef knot) - Simple to make, the square knot is used for lots of light duty including tying things down. Start with an overhand knot like you were beginning to tie your shoe. keeping the ends of the lines in your hand on the same side, cross them again and tie another overhand knot. If you don't keep them on the same side you'll end up with a granny knot that will jam.



Sheet Bend – Quick and easy to tie, the Sheet Bend is one of the most commonly used knots for joining two lines. Start by folding the end of a length of line to form a loop. Pass the working end of the second line up through the loop. Next pass the working end of the second line around and behind the loop. Bring the working end to the front passing it over the loop and under the second line where it comes up through the loop.



Undocking Plan

Prior to getting underway, you should implement an undocking plan with the help of your passengers. You should consider the traffic in the area, the direction of wind and current and the depth of the water.

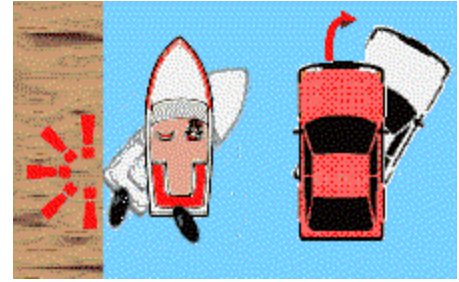
Do not assume that everyone onboard has the same boating experience that you have or that they can read your mind. Be specific and give direction if you ask for their help. Telling a passenger to attach a spring line means nothing if that person doesn't know the meaning of the term, which line to use and where (and how) to tie it.

Make sure that your engines have run for a few minutes and that they are warmed up before casting off lines. (Long idle periods are not recommended.) Also, check the oil pressure and other items on your pre-departure checklist prior to leaving the dock.

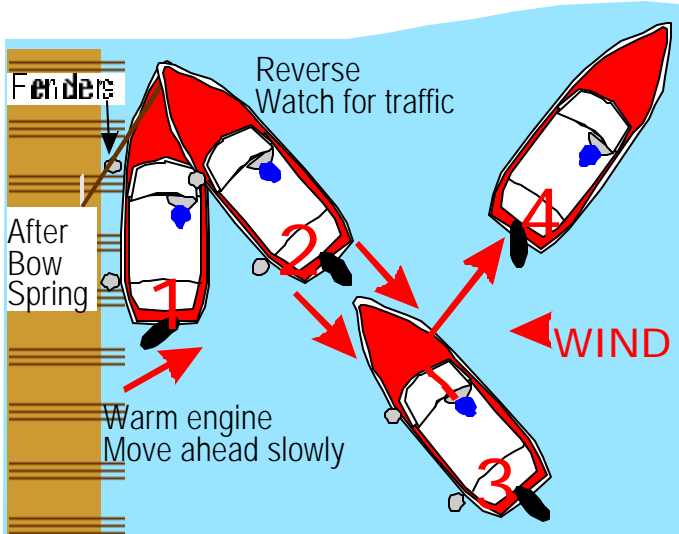
When the wind or current is pushing your boat away from the dock the procedure is simple.

1. Cast off lines and pull in fenders as the wind blows you away.
2. When clear and safely away from the dock and other boats, shift to forward and depart at idle speed.
3. Be careful to make sure you have been pushed safely away and that the stern will not hit the dock as you motor forward and turn.

Remember: A boat does not steer like a car; it pivots on its axis at a point approximately one-third to one-fourth back from the bow when moving forward.



If the wind or current is pushing your boat toward the dock you will have to do some extra planning.



1. Cast off all lines except an after bow spring line. This line will keep you from moving forward and allow the stern to pivot away from the dock. (see illustration)
2. You may want to use a fender forward to cushion the bow of the boat against the dock.
3. Turn the motor or rudder to the direction necessary to push the stern away from the dock.
4. Shift into forward at idle speed. Slowly, very slowly.

5. The stern will swing away from the dock. When it is clear of all obstacles and traffic, cast off the spring line and back away from the dock.
6. When you are safely away, shift to forward and idle away from the dock.

Once you are clear of the dock, stow lines and fenders so they will not be in the way or pose a tripping hazard. Be sure to control speed when leaving the dock and check for other boats, swimmers or other obstacles.

Docking Plan

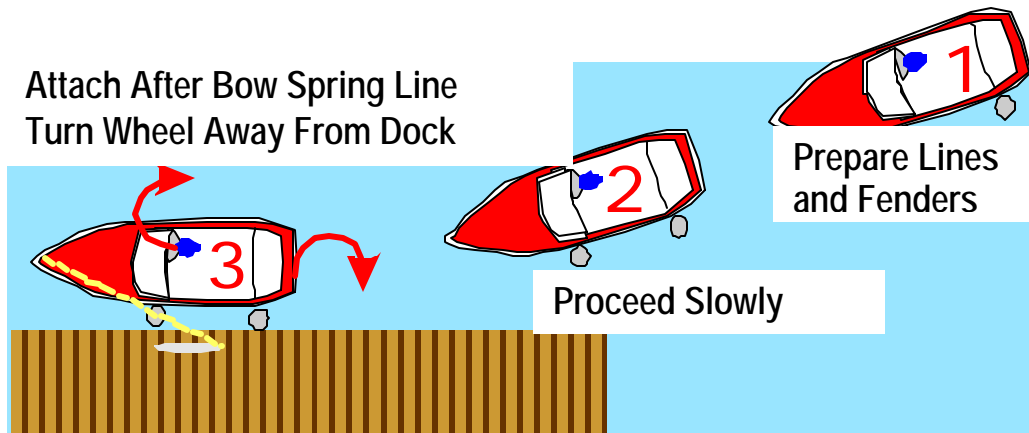
Before approaching the dock, one end of the docking lines should be secured onboard; fenders readied and speed reduced.

If the wind is onshore (blowing toward the dock), the boat is brought to a position parallel to the dock and about two feet off. The wind will blow the boat in. It can then be secured by bow, stern and spring lines.

If the wind is offshore (blowing away from the dock), you should approach the dock at a 20 to 30 degree angle. A bowline is passed ashore and secured. In boats with an outboard, or inboard/outboard engine, the engine is turned towards the dock and put in reverse. This will bring the stern into the dock. The boat can then be secured with the stern line.

The procedure is different for boats with inboard engines. The rudder will be used to bring the stern in. To push the stern in using the rudder, attach an after bow spring to keep the boat from moving forward. With the engine idling forward, turn the wheel away from the dock as illustrated below. Since the boat cannot move forward and the rudder is pushing the stern in,

the boat will pin itself against the dock while you secure the other lines. All maneuvers are more easily accomplished if the boat has twin engines, rather than a single engine. (This will also work for outboards and I/Os.)



Maneuvering Underway

Once underway your duties as a skipper do not stop. You are still responsible for the safety of all on board, your boat and damage to other boats and personal property caused by collision or damage from your wake. As skipper you should:

- Be familiar with the safe handling characteristics of your boat. Know its cruising speed, idle speed, how it turns left and right and its stopping distance.
- Always choose a safe course. Do not take any risks that might endanger yourself or your passengers or crew.
- Know where you are at all times. Check around you and use landmarks, aides to navigation, charts or any other means possible to pinpoint as accurately as possible your location. If you have an emergency and have to call for help, the first question you will be asked is "where are you?"
- Keep an eye on the wind, current and weather. Will any changes affect you and the course to your destination?
- Follow the rules of the road and obey them. In specially marked or crowded areas control your speed.
- You should always render assistance to other boaters in danger or distress. This could be anything from a stalled engine to a life-threatening event.

Boat handling- All boats handle differently and inexperienced operators require hands-on practice with an instructor/experienced boater. This can apply to experienced operators with a new boat as well.

- A motorboat is most easily maneuvered going against the current or wind;
- When moving with the wind or current, you must go faster than the current to maintain control of the boat.
- If you need to quickly reduce speed, put motor in reverse and apply power.
- Keep in mind the old saying "a kick ahead is better than a kick astern"...you have more control over forward motion than stern motion due to the design of rudders and/or propulsion systems.

Factors affecting handling- Every boat handles differently and the conditions of operation affect how it responds. It is essential to review the basics with each new boat, and under the various conditions you can expect to operate in.

- Hull Type
- Wind/Current- dependent on how much exposure to each ("sail area" of superstructure, draft etc).
- Propeller type/number- prop walk (stern walks to right with right hand screw in forward gear, to the left in reverse), which is more pronounced at high speed with blades near surface or slow speed in reverse.
- Rudder response- loss of control at slower, through-the-water, speed.
- Propeller thrust- can be used to obtain more control if used in short bursts when turning.
- Wave action- use trim, heading and speed adjustment to deal with wave action (more advanced techniques such as sea anchors can be used in very rough conditions).

Anchoring



At some point in your boating career you will probably want to anchor. You may want to stop and fish, swim, have lunch or stay overnight. A second reason to drop anchor may be to control the boat if bad weather is blowing you ashore or if your engine has quit and the wind and current are pushing you into shore or other boats.



The first step in anchoring is to select the proper anchor. In spite of claims to the contrary there is no single anchor design that is best in all conditions. On most pleasure boats the three anchors you will find most are the fluke or danforth type, the plow and the mushroom anchor.



Anchors also must have something to attach them to the boat. This is called the anchor rode and may consist of line, chain or a combination of both. The whole system of gear including anchor, rode, shackles etc. is called ground tackle.

The amount of rode that you have out (scope) when at anchor depends generally on water depth and weather conditions. The deeper the water and the more severe the weather the more rode you will put out. For recreational boaters let it suffice to say that, at a minimum, you should have out five to eight times (5 to 1 scope for day anchoring and 6 to 8 to 1 for overnight) the depth of the water plus the distance from the water to where the anchor will attach to the bow. For example, if you measure water depth and it shows four feet and it is three feet from the top of the water to your bow cleat you would multiply seven feet by six to eight to get the amount of rode to put out.

Anchoring considerations

- Type and weight of boat determines: anchor size; anchor chain/anchor line diameter, mooring bit or cleat size/strength.
- Character of bottom determines anchor type.

Types of anchors

- **Kedge** - for rocks and heavy grasses.
- **Burying** - buries into bottom for clay, sand and mud (Plow, Danforth, Bruce).
- **Mushroom** - sinks into bottom; for permanent moorings.

NOTE: Boats should carry at least two anchors, a smaller, lighter anchor for calm weather, and a larger one for bad weather conditions or when anchoring overnight. Anchors can become stuck, making a backup necessary since the only solution may be cutting the anchor line and abandoning the anchor.

Anchor Line (rode)- Nylon works best due to its ability to stretch, thereby absorbing surges in heavy seas. A typical rode consists of nylon line with a short length (6'-8' or longer) of chain between the line and anchor. The chain will aid in lowering the angle of pull on the anchor and prevents chafing of the line when the anchor gets buried.

- Three-strand nylon
- Double braided nylon
- Diameter of anchor line - too small or too large is bad.

Anchor Scope- This refers to the length of anchor line needed when anchoring.

- Average depth of water determines anchor scope.
- Ideal scope is 7:1 (ratio of the amount of rode to depth of water).
- Strength of the wind and/or current affects scope, may increase to 10:1 ratio in heavy weather.

Selecting an Anchorage

- Select site protected from wind, seas, strong currents and other boat traffic.
- Check chart for water depth (be mindful of tides) and bottom type (avoid rocky, and steeply sloping bottoms).
- Verify water depth at anchorage and within radius of swing (tidal flow may affect swing); ensure clearance above shallowest point.
- Ensure clearance from other boats or obstructions in radius of swing.

Anchoring

- Prepare and inspect gear; lay out or fake line needed for scope.
- Head your boat into the wind or current.
- Lower anchor with line under bow rail; make sure you are not standing on any part of the line or loop as it goes over the side; be sure the end of the anchor line is secured to the boat.
- Reverse the engine to stop headway. Leave in reverse at idle speed.
- When the boat starts to make a slight sternway through the water, lower the anchor from the bow. Pay it out as needed, preferably with a turn of line around the bit or cleat.
- When the full rode is out, snub the line quickly to set the anchor.
- Back up slowly to help anchor dig in.
- After anchoring, check position by sighting on some shore landmarks to make certain that the anchor is not dragging; reset anchor if necessary.

NOTE: Avoid anchoring from the stern, especially in small boats.

Getting Underway

- Run up to the anchor slowly under power, hauling in line as you go. Let the boat do the work.
- When anchor line is straight up and down, attempt to break anchor free. If it doesn't come free, tie off to bitt/cleat and allow wave action to break it free. If this doesn't work, move ahead under power a few feet. If this doesn't work, run slowly in a wide circle around the taut line.
- Once freed, haul the anchor line in, shaking it up and down to free it of weeds or grass.

- Clean the anchor and chain of sediment by swinging it back and forth near the surface.
- Carefully haul anchor and chain on board avoiding it striking the hull, and passing it under the railing if there is one.
- Stow anchor and rode immediately, ready for next use.



BEACHING

Beaching a boat is a common practice, but one that requires care to avoid damage to the hull, rudder/s, propeller/s and any other gear attached or projecting below the bottom. The operator must know where all such gear is located on the hull and the amount it projects from the hull.

Common considerations

- Depth of water
- Type of bottom/beach
- Slope of bottom/beach
- Draft of boat
- Draft of boat at points that will make contact with shore/bottom.
- Wave action
- Current
- Tide

NOTE: Do not allow anything but the hull to be load bearing on the shore/bottom.

Beach Selection

- Sandy, clay, mud or gravel bottoms are best.
- Medium to steeply sloped bottoms.
- No obstructions at or below surface, or immediately downriver.
- Area protected from wave/wake action.

Approach

- Scout area slowly. If in a twin engine, outboard/IO boat; turn off and raise one engine, raise other as high as possible yet still operate efficiently at slow speed. In a single engine, outboard/IO boat, raise engine as high as possible yet still operate efficiently at slow speed. Verify condition of bottom and determine drift if any.
- Make approach so as to touch bottom with bow first. In moving water, use heading and engine speed necessary to hold position relative to landing point.
- Maintain slowest speed possible to bring boat ashore at desired point.
- Shift to neutral and drift into shore, timing shift so as to have almost no way on when contact is made.
- Have crewperson go ashore and make boat fast.
- Switch engine off when boat is secured.

NOTE: If any personnel or gear is removed from boat, it will be necessary to reposition boat further up onto the beach due to change in draft.

Making Fast/Holding position

- Tie bowline or anchor line to solid object (tree, large rock etc.).
- Set anchor on beach (bury it).
- If you don't have an anchor, make a sand anchor by tying bow line or anchor line to small log, or similar object and burying it at 90-degree angle to pull of line.
- Hold position with engine thrust (short term, requires operator to remain on board).
- Hold position by posting crewperson on beach, holding bowline. Operator should remain on board in event crew cannot hold boat.
- Small boats with no hull projections may be carried up onto beach, well away from waterline.

Getting Underway

- Lengthen mooring line, pushing the boat into a nearly free-floating position before loading gear and/or personnel on board.
- Lower at least one engine to a minimum working depth, start it and allow to warm up fully.
- Load gear and/or personnel.
- Put engine in forward gear with minimum RPM's to hold position.
- Have crewperson bring in mooring line and come aboard.
- Back down slowly to break bow free. In sandy, clay or mud bottoms, this may require allowing the backwash from the prop enough time to break the suction of the hull to the sediment.
- Back far enough out to pivot safely, being mindful of stern swing and where that will place the prop in relation to the bottom or obstructions.
- In moving water, position thrust while backing to clear obstacles and if possible end up backing slightly downstream, so that you can make an upstream pivot to clear the area without drifting downstream too far.

LONG DISTANCE COMMUNICATION

VHF radiotelephone

A VHF (very high frequency) radiotelephone is used to communicate with other boaters, the Coast Guard, commercial vessels, draw bridge tenders, and lock operators. Recreational boats are not required by federal law to carry radiotelephone equipment, but they are highly recommended on larger waters. The Federal Communications Commission (FCC) regulates their use.

Boats carrying more than six passengers for hire, as well as many other commercial craft, are required to carry radio equipment. Operators of commercial craft should consult the nearest FCC office to determine the licensing requirements that apply to you and your boat. A copy of the station license must be kept on board near the transmitter; the license must be renewed every ten years with the FCC.

The U.S. Coast Guard enforces VHF regulations; fines for violations range to \$10,000, imprisonment for not more than one year, or both.

The VHF band has many channels however recreational boaters have limited access; examples of channels as follows:

- 06 - inter-ship safety communications only.
- 09 - commercial and non-commercial inter-ship, ship-to-coast (commercial docks, marinas, and some clubs), secondary channel for hailing and distress, monitored by the Coast Guard.
- 13 - ocean going vessels, bridge tenders, tugs while towing, locks.
- 16 - distress safety and calling, call Coast Guard, establish general contact, must be monitored, not for "chit-chat," call "Mayday" only when "grave and imminent" danger threatens your boat and immediate help is required.
- 22 - U.S. Coast Guard liaison, vessels, shore stations, after establishing communications on channel 16; Maritime Safety Information Broadcasts.
- 24 to 28, 84 to 88 - public telephone calls (to call the "marine operator").
- 68,69,71,72,78 - non-commercial inter-ship (recreational boat working channels) and ship to coast (marinas, yacht clubs, etc).
- There are marine weather stations (WX-1, WX-2, WX-3) that broadcast the latest available weather information from the National Weather Service continually; updated every 6 hours.

NOTE: Radiotelephone users must familiarize themselves with broadcasting procedures; once contact is made on an appropriate working channel, the exchange of transmissions must be: of a legally permissible nature; and of the minimum possible duration.

When not actively engaged on another channel, a voluntarily equipped vessel with its radio on is required to monitor Channel 16 (if possible monitor Channel 9 as well).

Call Priority (Channel 16)

- **MAYDAY**- calls involving imminent danger of loss of life or vessel.
- **PAN-PAN**- urgent communications concerning the safety of a ship, aircraft, other vessel or person in sight or on board.
- **SECURITE**- safety messages concerning navigation or weather.
- **Initial contact** - use this channel to hail another vessel and initiate contact on another, working frequency (can use Channel 9 too).

c. Transmitting a MAYDAY

- MAYDAY...MAYDAY...MAYDAY
- THIS IS (boat name)...(boat name)...(boat name)
- MAYDAY (boat name) POSITION IS (vessel position in latitude and longitude, or as a distance and magnetic/true bearing from a well-known navigation landmark).
- WE (nature of emergency).
- WE REQUIRE (type of assistance required).
- ABOARD ARE (number of adults and children on board) AND (safety equipment on board). (State conditions of any injured).
- (boat name) IS A (boat length in feet) FOOT (type: ketch, sport fisherman, etc.) WITH A (hull color) HULL AND (trim color) TRIM.
- I WILL BE LISTENING ON CHANNEL (16 or 2182).
- THIS IS (boat name). OVER.

Single-Sideband (SSB) radio

Reliable, direct voice communications over about 25 miles (depending on antenna heights) requires the use of medium frequency (MF) and/or high frequency (HF) radiotelephones or uses satellite technology. MF and HF radiotelephones are collectively referred to as Single-Sideband or SSB radios.

SSB is amplitude modulated, and uses only a single sideband adjacent to, rather than double sidebands on either side of, a carrier wave. It is sometimes referred to as AM radio, but this is a holdover from the days when marine MF and HF sets were of the double sideband (DSB) type, and no longer accurate.

A vessel must already be equipped with VHF-FM before being licensed for SSB. Due to crowding, "skip" and other factors, an SSB operator is required to attempt communication on VHF before using the 2-3 MHz band or higher frequencies, unless the transmitting station is clearly beyond normal VHF range.

SSB radiotelephones are commonly available with output power of 50-150 watts. The range is affected in part by transmitter power. All marine SSB stations operating in the 2-3 MHz band must be able to operate on 2182 kHz, the international distress and calling frequency. They must also be able to operate on at least two other frequencies. Most sets will have the desirable feature of one-button selection of 2182 kHz, and some will automatically generate the radiotelephone alarm signal on this channel.

The maximum effective range of SSB transmission in the MF band is 50-150 miles during the day. HF band transmissions can reach thousands of miles depending on various conditions. For those operating in areas where VHF and MF radio is not reliable, SSB sets should be capable of operating on the frequencies assigned to the Coast Guard's Contact and Long Range Liaison (CALL) system.

Digital Selective Calling (DSC) is now available on SSB sets, and can automatically alert the operator to an incoming call on any number of bands. This is desirable due to the large number of available frequencies.

Installation on other than large, metal ships requires the use of an auxiliary ground plane (usually a copper mesh panel). Generally speaking the installation process should be done by a qualified technician due to a number of adjustments and/or isolators/filters needed.

Satellite communications

Satellite communications systems (SATCOM) beam signals around the world via a chain of earth-based and orbiting space relay stations. SATCOM gives full access to voice, telex, facsimile and data networks. SATCOM systems are now available for vessels 40 feet or more in length. There are a number of systems available, each with varying services and limitations. These systems are expensive and require careful consideration before purchase. Consult a qualified technician for advice before buying.

Citizen's band radios

Used by boaters, but not monitored by the USCG. Range is limited, usually between 5-15 + miles.

Cellular phones

Are very useful but not as a substitute for a VHF radio. They work best in coastal areas near population centers. It is best to know the available emergency numbers in the location you are boating in. Program them into the phone and carry a waterproof card on board with the numbers printed on it.

Chapter VI – Emergency Procedures

Accidents

Major Types of Boating Accidents

- Collisions between vessels
- Collisions with objects
- Falls overboard
- Capsizing

Most collisions could be avoided by use of proper lookout, knowledge of "rules of the road", boat lighting requirements, and aids to navigation. Falls overboard are related to sea conditions, movement about the craft, and tripping/slipping hazards on board. Capsizing accidents usually occur in small boats due to sea conditions and/or improper weight distribution.

Common Fatal Boating Accidents

- Capsizing
- Falls overboard

The major determining factor in most fatalities is non-use of PFD's. People end up in the water who were not planning on being there and usually weren't wearing a PFD. Most deaths are due to drowning, with hypothermia being a major contributing factor. Most drownings occur within 10 feet of safety. Therefore, chances are most rescues will be a simple reach or throw. Vessels less than 16 feet account for most fatalities. Ironically, small vessels have less stringent equipment requirements.

Major Factors in Boating Fatalities

- Hypothermia
- Drowning

Hypothermia can cause death in and of itself given enough exposure time relative to the water/air/wind conditions. It can also hasten the onset of drowning in even the best swimmers due to its effects on the extremities. Many "good" swimmers drown attempting to reach shore or their boat due to hypothermia.

A well-prepared boater must understand the basics of hypothermia and cold water, near drowning in order to prevent them from occurring, or mitigate their effects in an accident.

Fatal Vs Non-Fatal

Most fatal accidents are caused by persons falling overboard or the boat capsizing and the victims drowning because they are not wearing PFDs. Even if you are a good swimmer, the urgency of going into the water unexpectedly along with fatigue caused by stressors could render you helpless.

Most non-fatal accidents are caused by collisions with other boats or objects in the water. Remember that the rules of the road require that a lookout be posted at all times. Make sure your lookout is doing his or her job.



Small open boats are somewhat unstable and tippy. Be sure that the boat is tied securely to the dock when boarding and step into the centerline of the boat running fore and aft.

With a hand on the pier and one on the boat, lower yourself down into the center. Although not required, you should wear a PFD. All other passengers should follow suit and keep low when moving around in the boat.

You should not attempt to carry items aboard the boat. You should board first and load them one at a time and, again, place them along the centerline of the boat. Remember to not overload the boat.

Read and take heed of the capacity plate information. Make sure all passengers and carry-on items are secure and the weight evenly distributed.

Once underway, avoid standing up, riding on the bow or gunwale (side) of the boat, trim the boat so it rides level and avoid making sudden sharp turns.

Capsizing - The majority of small pleasure boats, and all built after 1978, have floatation to keep them from sinking even if they capsize. If you should capsize it may be safer to stay with the floating boat than try to swim to shore.

A small unstable, tippy boat may capsize from the following causes:

- **Overloading** slows a boat down and reduces the amount of freeboard (area above the waterline). A low freeboard increases the possibility of swamping the boat or taking on water that will slow the boat even more. Don't overload your boat with passengers or equipment.
- **Improper weight distribution** can make the boat even more unstable. You must locate persons and equipment in order to balance the boat and keep water out.
- **Waves** can be a major factor in capsizing especially if they are unexpected. Anticipate all waves and aim the bow into them.

Should your boat capsize, take a head count to make sure everyone is there, check for injuries and stay with the boat. Only swim for shore if you know that you will make it easily. If you have any doubt stay with the boat.

If you can, turn the boat upright and bail it out. Once most of the water is out climb back in. Or, if close to shore, just climb in the boat and paddle. It will be exhausting but at least you will be safely ashore.

Accident Reports

Federal law states that if you are involved in a boating accident that includes injury requiring medical treatment, death, disappearance of a person, or property damage of at least \$500.00, you are required to stop, identify yourself and your boat, and give help as needed. Additionally, you are required to file an accident report with the responsible local law enforcement agency, the appropriate agency accident form, and to your immediate supervisor.

Many states have more stringent laws on reporting accidents - check your state specific information. If in doubt, report the accident.

Boating accidents include; capsizing, crew overboard, collisions, fire, sinking & flooding, explosions and disappearance.

Failure to provide assistance or identify yourself when involved in an accident is a serious offense and can carry a severe fine or even imprisonment.

Crew Overboard

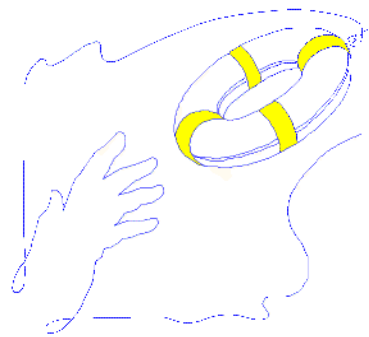
Standing or riding on the gunwales or bow of a boat causes most crew overboard situations. If you must move around in a boat which is underway, stay low, hold on to both sides and have at least three points of contact with the boat at all times.

Crew Overboard Procedure

1. Whoever first sees or hears someone go overboard should shout, "crew overboard (port or starboard)". This person should become the spotter and continually point to the person in the water until the boat is safely alongside. Try not to lose sight of the crew overboard; it is extremely difficult to locate a person in the water.
2. Turn the bow of the boat quickly toward the side the person fell over and stop the boat. Turning toward the person will push the stern and propeller away.
3. Immediately throw a life saving device toward the person so they will have some assistance in keeping afloat. Your type IV throwable flotation device should always be immediately accessible and within reach of the helm.
4. Slowly turn the boat and make a gentle turn keeping the person in view.
5. Approach the person slowly into the wind or current.
6. When the person is alongside turn off the engine.
7. Adjust the weight to keep the boat trimmed and help the person aboard. Usually over the stern.

Do not go into the water to assist the person unless absolutely necessary. If the victim is unable to board or needs further assistance and someone must go into the water, make sure they have on a PFD and that they are attached to the boat with a line.

In water survival



Should you find yourself in the water there are survival techniques you can use while waiting to be picked up. Hopefully, you have been a safe boater and you have on your PFD. If not, you will have to float or tread water until rescued.

One method of **floating** is the horizontal back float. This comfortable position keeps your face out of the water and allows you to conserve energy. You simply lie back motionless with your arms outstretched, arching your back slightly; allow your legs to rise straight out.

Another method of floating is the vertical back float. This position does not float your entire body on the water's surface. Your body is still underwater except for your face and upper chest with your arms extended out to each side.

If you cannot float in this manner, you can practice **survival floating**. Very simply put, tilt your head back, slowly press down with your arms and legs to bring your mouth above the water, inhale, hold your breath and go limp for a few seconds. Your face will go underwater while you dangle your arms and legs. Exhale as you are tilting your head back and preparing to break the water's surface so that a minimum amount of energy and movement is required to keep your head out of the water long enough to inhale.

Treading water requires more energy than floating but keeps your head above water. Treading water is accomplished by doing a slow series of scissor kicks with your legs while slowly waving your outstretched arms back and forth on the water's surface.

When you find yourself in the water keep your clothes on to help prevent heat loss. Because they also trap air they can assist you in floating.

SELF RESCUE

Boat operators and their crew should be able to rescue themselves in the event they end up in the water. This includes being able to get back onto the boat, or mitigate the effects of having to stay in the water. It is **ESSENTIAL** that operators utilize their engine kill switch if available. This small device can make the difference between life and death should you fall overboard. Many boaters have fallen over, only to watch their boat motor on out of sight, or worse yet, circle over them ("circle of death").

Self Rescue- boat can be reached

- **Chin up bounce-** Difficult for most people, especially on high-sided boats. Grab stern or gunwale at lowest point and bounce up as if doing a chin up. On second bounce, try to get upper half of body over the gunwale and into boat, roll into boat.
- **Stirrup-** Try and find loose line hanging off the boat and tie in a loop. Step into loop; use line to climb back into boat.
- **Cavitation Plate-** If engine is out of gear, use cavitation plate on outboard engine or outdrive as a step. Climb onto transom using engine for support.

Self Rescue- boat unavailable, cold water

- **Heat Escape Lessening Posture (H.E.L.P.)-** Defensive posture used by solitary victim to lessen heat loss. Cross legs, fold arms, bring knees up, and hunch shoulders to neck. Can increase survival time as much as four times.
- **HUDDLE-** Defensive posture used by two or more victims to lessen heat loss. Place arms around each other, and intertwine legs. Can increase survival time as much as four times.

NOTE: H.E.L.P. and HUDDLE are not to be used in moving water due to the risk of entrapment or collision.

VICTIM RESCUE

Characteristics of a person in distress

- Can wave and yell for help.
- Has not yet reached the panic stage.

Characteristics of a person drowning

- Cannot speak, consciously wave for help, or consciously grab rescue device.
- Has reached the stage of panic. This is usually accompanied by inability to breathe. Victim is under the surface most of the time.
- May have as little as 20 to 60 seconds before they go under; or may disappear immediately.
- Appear to be doing a breaststroke with arms raised above head, head is tilted way back, and mouth is wide open. May have appearance of playing/splashing.
- Victim will probably attempt to climb onto you if you get too close to them.

Priorities in rescue situations

- Self most important.
- Partner(s) second most important.
- Victim third important.

Rescue Sequence (listed in order of increasing risk to rescuer)

- Talk into self rescue
- **Reach**
- **Throw**
- Boat ("**Row**")
- In-Water (**Go**)
-

Note: Maintain visual and verbal contact while using any rescue technique

Assistance From Shore

Every year people drown within a short distance of the shore. When some trauma happens, such as stepping off an underwater shelf the surprise itself can cause a drowning response. The victim, even if they can swim, suddenly cannot shout for help and just splashes around in the water. Exhaustion can occur in a minute or less and the person then quits splashing and sinks. Should you find someone needing assistance from shore, remember the following.

Talk into self rescue- Since most people end up in the water within 10 feet of safety; many rescues are simply a matter of getting the victims attention and directing them into one of the self-rescue techniques to regain entry into the boat.



Reach rescue- In this rescue some type of device is used to extend the rescuers reach to the victim. The proximity needed is determined by the device used, sea conditions, wind speed/direction, and ability of the rescuer. They are quick to deploy and leave the rescuer on a safe platform. Use boat hook, paddle, fishing pole, etc.

- Brace yourself - if possible get someone to hold you.
- Extend device to victim. Remember that a drowning victim cannot think rationally, tell him/her what you want them to do.
- Be careful that victim does not pull rescuer into the water, rescuer should be prepared to let go of reach device if the situation deteriorates.
- Pull victim to boat.
- Talk into self-rescue or assist into boat.

Throw Rescue- Use when victim is too far away to use a reaching device, or distance may increase quickly. Throwing devices have the same limitations as reaching devices, are quick to deploy and give a greater reach. Use the same techniques as described in the reach rescue. Typical devices include:

- Type IV ring buoy with 70' polypropylene line attached- Offers flotation to victim, but requires skill and accuracy to land near victim.
- Throw bag or heaving line- Offers no flotation to victim, requires skill and accuracy to land near victim.



- Alternatives- Any type PFD (be sure to "handle" the device to make it easier to throw over distance). Anything that floats (cooler, tire, etc.), attach line if possible. Throw upstream or upwind so device will float to victim. Remember, when there is current, surface water generally moves faster than the victim.



Boat rescue ("row")- Use when victim is too far away for a reach or throw. The boat serves as an extension of shore, placing the rescuer in the vicinity of the victim so that a less risky reach or throw can be executed.

- Approach victim from downwind or current for better control.
- As boat nears victim, shut engine off, in gear, unless other hazards dictate otherwise (i.e. obstacles, dams, currents, etc.).
- Use reach and throw techniques.
-

In-water Rescue ("go")- Most dangerous form of rescue, should only be attempted by individuals who have been trained, have practiced, and who are in adequate physical condition. Used when condition of victim is such that he/she cannot help themselves, and it's not possible to maneuver the boat close enough for a reach rescue. Cold-water rescue (less than 70 degrees) requires use of cold-water survival suit.

EXTRICATION FROM WATER

Getting victim into the boat- Position victim alongside boat where freeboard is at a minimum. Usually this is the stern or as far astern as possible. The choice of technique is dependent on both the boat and the victim's condition/cooperation.

Conscious victim-no major injury: If possible, provide victim with PFD.

- Ladder- Easiest and most effective of all retrievals.
- Stirrup- Fasten line with loops to cleat use as a rope ladder.
- Retrieval strap- Commercially available, padded loop with hand holds, or large loop tied into end of line. Put loop around victim under armpits. May need two rescuers. Use bounce technique to assist victim to sitting position on rail, and then into boat.
- Bounce- Grab victim's PFD, shirt, wrists, or armpits. Bounce victim twice, pulling as high as possible on second bounce onto gunwale, and then into boat.

Unconscious or weak/injured victim: Support victim with a PFD during retrieval.

- Roll aboard- Secure end of blanket or net by tying to rail or standing on it. Put rest of net in the water and place under the victim. Rescuers grab the outside of the net and pull up in unison.
- Retrieval strap- Commercially available, padded loop with hand holds, or large loop tied into end of line. Put loop around victim under armpits. May need two rescuers. Use bounce technique to assist victim to sitting position on rail, and then into boat.

NOTE: Do not use for victim with suspected head/cervical/spinal injuries.

Suspected head/cervical/spinal injuries: Requires highly specialized training and equipment, most likely provided by local emergency medical services (EMS). Symptoms include: Pain, loss of movement and feeling, tingling, deformity of back or neck, breathing stopped. If hypothermia or other life threatening conditions are not a factor, keep victim in water until EMS arrives. Try to eliminate any movement caused by waves, etc.

NOTE: Possible spinal injury treatment and management requires specialized training and practice. For this reason, information on spinal injury treatment is not included in this document. Obtain training and utilize local protocols.

Drowning

Usually defined as suffocation in a liquid. It is a leading cause of death among boaters and would be rescuers. Many people who fall in the water cannot swim well. For those who can swim well it usually results from underestimating the power of moving water, and/or the effects of hypothermia on swimming ability. In a rescue situation, failure to follow the rescue sequence puts the rescuer at additional risk.

Types of Drowning

- **Dry**- little or no water enters the lungs (10-15% of all drownings).
- **Wet**- aspiration of water into the lungs (85-90% of all drownings).
- **Secondary**- a person successfully revived, but dies later due to complications.
- **Cold Water Drowning**- a person who drowns in cold water, and can still be successfully revived.

NOTE: Any revived, near drowning victim must seek medical attention to avoid the risks of secondary drowning.

Cold Water Drowning Survival Factors

- Age- younger the better.
- Length of submersion- shorter the better (individuals have been successfully revived after being under water for over one hour).
- Water Temperature- colder the better (cold produces beneficial physiological changes).
- Water Quality- cleaner the better.
- CPR Quality- 2-person preferred; steady, high quality compressions/ventilations, confirmed circulation.
- Victim Struggle- less is better.
- Physical condition of the victim- other injuries can complicate survival.

Care For Drowning

- Remove from water.
- Ensure ABC's and initiate CPR as appropriate.
- Prevent further heat loss.
- Handle gently.
- Administer 100% oxygen.
- Transport to nearest medical facility that can handle emergencies. A drowning victim is not dead until they are warm and dead.

NOTE: Possible spinal injury treatment and management requires specialized training and practice. For this reason, information on spinal injury treatment is not included in this document. Obtain training and utilize local protocols.

Hypothermia

Even when the weather is warm, do not forget that in many areas the water can be very, very cold. A sudden unexpected wake or other "unbalancing event" can land you in the frigid water. Although the possibility of drowning from falling into the water is a real threat, so too is hypothermia.

Hypothermia is a condition that exists when the body's temperature drops below ninety-five degrees. This can be caused by exposure to water or air. The loss of body heat results in loss of dexterity, loss of consciousness, and eventually loss of life. A few minutes in cold water makes it very difficult to swim, even to keep yourself afloat. In addition, a sudden, unexpected entry into cold water may cause a reflexive "gasp" allowing water to enter the lungs. Drowning can be almost instantaneous.

Your body can cool down 25 times faster in cold water than in air. If you examine the chart below you will see that survival time can be as short as 15 minutes. Water temperature, body size, amount of body fat, and movement in the water all play a part in cold-water survival. Small people cool faster than large people and children cool faster than adults.

PFDs can help you stay alive longer in cold water. You can float without using energy and they cover part of your body thereby providing some protection from the cold water. When boating in cold water you should consider using a flotation coat or deck-suit style PFD. They cover more of your body and provide even more protection.

Hypothermia does not only occur in extremely cold water. It occurs even in the warmer waters of Florida and the Bahamas.

Hypothermia - Develops when the body's core temperature has been lowered to, at or below 95 degrees Fahrenheit.

Types of Hypothermia

- **Chronic**- occurs from prolonged exposure to the water/air environment.
- **Acute**- occurs from sudden immersion in cold water.

Note: Water conducts heat 25 to 35 times faster than air at the same temperature.

Methods of Body Heat Loss

- **Conduction**- direct transfer of heat from body by direct contact with water, or some solid surface (rock, ground, boat deck).
- **Convection**- loss of heat by air or water moving across the body and carrying it away.
- **Radiation**- loss of heat energy to the environment from unprotected parts. Over 50% of heat loss is from the head, followed by the neck, armpits, chest and groin.
- **Evaporation**- conversion of perspiration into water vapor, cooling the body at the surface.
- **Respiration**- exhalation of water vapor carrying with it heat from the body.

Heat Loss Factors

- **Age**- children lose heat faster than adults.
- **Body Build**- thin people lose heat faster than heavier people.
- **Movement in Water**- a person swimming or aggressively moving in the water will lose heat faster than someone passively floating.
- **Alcohol/Caffeine**- dilates the blood vessels, causing victim to lose heat faster.

Hypothermia is a progressive problem as the body passes through several stages before an individual lapses into an unconscious state. The extent of a person's hypothermia can be determined from the following:

- **Mild Hypothermia** - the person feels cold, has violent shivering and slurred speech.
- **Medium Hypothermia** - the person has a certain loss of muscle control, drowsiness, incoherence, stupor and exhaustion.

- **Severe Hypothermia** - the person collapses and is unconscious and shows signs of respiratory distress and/or cardiac arrest probably leading to death.

Hypothermia Chart		
If the Water Temp. (F) is:	Exhaustion or Unconsciousness	Expected Time of Survival is:
32.5	Under 15 min.	Under 15 - 45 min.
32.5 - 40	15 - 30 min.	30 - 90 min
40 - 50	30 - 60 min.	1 - 3 hours
50 - 60	1 - 2 hours	1 - 6 hours
60 - 70	2 - 7 hours	2 - 40 hours
70 - 80	3 - 12 hours	3 - Indefinitely
Over 80	Indefinitely	

Note: Temperatures listed are approximate due to individual differences in normal body temperature and response to change.

Conservation of heat is the foremost objective for a person in the water. To accomplish this limit body movement. Any action generates heat that is absorbed by the water. Don't swim unless you can reach a nearby boat or floating object. Swimming lowers your body temperature and even good swimmers can drown in cold water.

If you can pull yourself partially out of the water - do so. The more of your body that is out of the water (on top of an over-turned boat or anything that floats), the less heat you will lose. Especially keep your head out of the water if at all possible - this will lessen heat loss and increase survival time.



Wearing a PFD in the water is a key to helping the person survive. A PFD allows the person to float with a minimum of energy expended and allows them to assume the **heat escape lessening position** – **H. E. L. P.**

This position, commonly referred to as the fetal position, permits the victim to float effortlessly and protect those areas most susceptible to heat loss including the armpits, sides of the chest, groin, and the back of the knees. If you find yourself in the water with others, you should huddle as a group to help lessen heat loss.

Care for Hypothermia

- Ensure ABCD (airway, breathing, circulation, degrees-prevent further heat loss).
- Protect victim from cold environment.
- Remove wet clothing, wrap in dry clothing and/or blankets.
- Insulate from ground.
- Handle gently.
- Transport to medical facility as soon as possible.
- Beware of afterdrop, as body rewarms, cold blood trapped in extremities moves into the core. The heart may be affected, causing arrhythmia.

Do not massage the victim's arms and legs. Massage will cause the circulatory system to take cold blood from the surface into the body's core, resulting in further temperature drop. Do not give alcohol, which causes loss of body heat, or coffee and tea that are stimulants and may have the same effect as massage.

Treatment of hypothermia can be accomplished by raising the body temperature back to normal. Re-establishing body temperature can be as simple as sharing a sleeping bag or blanket with another individual, or applying warm moist towels to the individual's head and body. A warm bath could be used for mild to medium hypothermia but never if the victim is unconscious. Do not attempt to raise the temperature too rapidly, gradual warming is recommended.

Prevention of Hypothermia

- Rest and eat high-energy foods prior to exertion.
- Maintain fluid and food intake during workday.
- Dress in layers.
- Protect areas of high heat loss (head, neck, armpits, groin).
- Recognize signs and symptoms of hypothermia, intervene early.

Cold Water Survival

- If sudden immersion, cover mouth and nose to prevent gasping in water.
- Wear a PFD.
- Keep clothes on.
- In most cases do not try to swim. An exception is in moving water (streams, rivers with fast currents). In that situation, back or sidestroke at an angle, head pointed upstream, toward the shoreline. Do not attempt to fight the current.
- Get out of the water as soon as possible, even part way (i.e. crawl up on top of overturned boat).
- If you cannot get out of the water, use the Heat Escape Lessening Posture (HELP), or the Huddle position (depending on number of people) to conserve body heat.
- Allocate resources for group survival. Rotate people into the "warmest" area regularly.

NOTE: According to the U.S. Coast Guard, water less than 70 degrees F is considered cold water.

Fires On Board

An onboard fire is a serious event. If the fire cannot be controlled where does one go except in the water? The fire triangle consists of fuel, oxygen and heat. All three must be present to start a fire and the removal of any single one can extinguish a fire.

Fuels, such as gasoline and propane, can be very dangerous if precautions are not taken. The fumes of these fuels are heavier than air and tend to collect in the cabin, bilge and other lower areas of the boat. Because they naturally are surrounded by oxygen all that is necessary to start a fire is heat. This could come from something as simple as a spark from an ignition component. All you did was turn the key to start the engine and boom. Most boat explosions and fires occur during or right after fueling.

You should read and understand the instructions on your fire extinguisher(s). If a fire starts you should be prepared and not hesitate. Grab the fire extinguisher, activate it, and direct it at the base of the flames using short bursts and sweeping it from side to side.

If underway and a fire starts, stop the boat and position it in such a manner that the fire is downwind. Order everyone to put on lifejackets. If possible try to turn off the fuel source to the fire. Grab the extinguishers and control the fire.

(Check the gauge on your fire extinguisher regularly to ensure that it is charged properly. Also, check the seals to make sure nothing has been tampered with. Remember, you should have the extinguisher recharged after you have used it.)

Fire Suppression

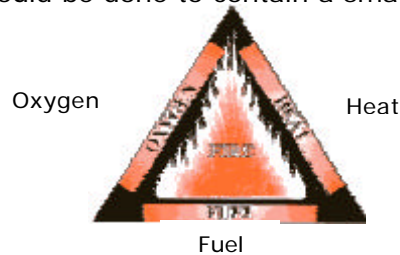
Of all reported boating accidents, fires typically rank 7th in frequency of occurrence (US Coast Guard). In fact there is a higher probability of a fire on a boat than one on land. There are few accidents that are less frightening than a fire on board a boat.

Fuel and fuel vapors are the two leading ingredients in all boating fires and explosions. The best policy is to avoid fires through proper safety precautions during fueling, and in the storage of fuel.

If you are faced with a fire on board your vessel, the priority is to save lives, not property (boats). Fire fighting should be done to contain a small fire, enabling safe exit of you and your crew.

Fire Triangle

- Heat
- Oxygen
- Fuel



Fire fighting at its most basic consists of removing at least one element of the fire triangle. On small boats we do this primarily through the use of fire extinguishers.

The USCG requires that all vessels with closed compartments carry at least 1 B-I extinguisher. The most common extinguisher used is the Dry Chemical extinguisher, which can be used on Type B (flammable liquids) and C (electrical equipment) fires. The Coast Guard requirement should be treated as a minimum, consideration should be given to potential fuels carried, their amounts and locations when selecting extinguishers.

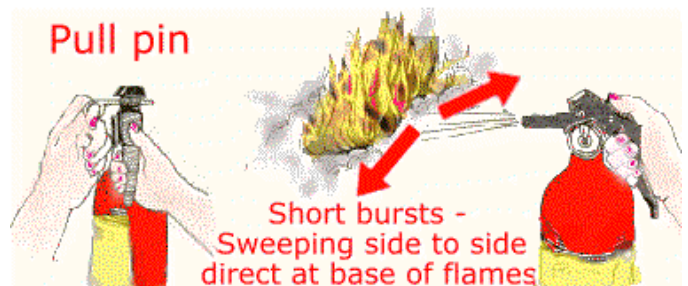
Extinguishers of appropriate type should be placed where needed, in a visible, accessible location. Placement near doors or hatches, away from major fuel sources is preferred.

Priority of Response- Quick, decisive action is needed to lessen the severity of the accident.

- Abandon ship if necessary - depends on extent of fire/explosion and availability/ability to fight the fire. If not abandoning ship;
- Head boat so flames blow outboard, stop boat; turn off engine, blower and main electrical circuit;
- If burning material is not attached, throw overboard
- Make radio distress call if needed/time permits;
- Move passengers to safe area w/PFD's on;
- Use appropriate fire extinguisher to fight fire.

Fire Extinguisher Use- Portable fire extinguishers have a brief discharge time, and are limited in the size of fire they can control. Early, quick, effective action is necessary to control even small fires. Use the **P.A.S.S.** technique:

- **P- Pull pin**
- **A- Aim at base of fire**
- **S- Squeeze handle**
- **S- Sweep side to side, using short bursts, ½- 1 sec each; check flames after each sweep; watch for flare-ups.**



Firefighting Strategies

Fire Type	Responses to Fire
Gasoline, Diesel, Grease	Use Class B foam, CO2 or Dry Chemical
Engine Fire	Shut off engines, generators, and fans. Close doors/hatches to area. Activate engine-room extinguisher system if available. Prepare to abandon ship, transmit distress signal. After 15 minutes, open hatch as little as possible and assess, use Class B, hand-held extinguisher to fight remaining fire if any.
Electrical Fire	Turn off electrical source; use Class B, C or C extinguisher only to fight fire.
Galley Fire	Shut off fuel source to stove. Use Class A, B, C extinguisher to fight fire as appropriate. Baking soda can be used when extinguisher not available. Pan fires can be extinguished quickly by placing lid on pan. Do not use Class A extinguishers on grease fires.
Below Decks Fire	Most are fueled by wood, paper and fabric. Use Class A extinguisher and remove oxygen by closing compartment after flooding fires base.

First Aid

Every boater should take an American Red Cross or other approved first aid course. It is not only important for your own personal safety but for your passengers and other boaters you may encounter who need first aid assistance. You should also equip your boat with a first aid kit. This kit should be sufficient to deal with common problems such as sunburn, scrapes, bruises, minor burns, seasickness and bug bites.

Supplies

The following is a **minimum** inventory of first aid supplies you should carry.

- First aid manual
- Adhesive bandages in various sizes
- 3-inch sterile pads
- Triangular bandages
- 1-inch and 3-inch rolled bandages
- Tweezers and blunt scissors
- Cotton balls and cotton tipped applicators
- Antiseptic
- Sun screen (minimum SPF 15)
- Calamine lotion
- Motion sickness pills or patches
- Aspirin or substitutes
- Eyewash cup

Shock

Untreated, shock can cause death from a collapse of the cardiovascular system carrying oxygen to the body's vital organs. The signs of shock may include cold, clammy skin; profuse sweating; a pale color; bluish lips; rapid pulse and labored or rapid breathing.

To treat shock, lay the victim on their back and cover with blankets or clothing to keep warm. Elevate the feet 8 to 12 inches higher than the head. Do not give the victim anything to eat or drink. Keep the victim comfortable until help arrives.

Bleeding

- Control external bleeding by following these guidelines:
- Place direct pressure on the wound with a sterile dressing or clean cloth.
- If you do not suspect a broken bone, elevate the injured part above the level of the heart.
- Apply a pressure bandage to hold the dressing or cloth in place.
- Wrap bandage snugly over the dressing to keep pressure on the wound.
- If blood soaks through the bandage, add more pads.
- Continue to monitor vital signs.
- Help the victim rest in a comfortable position
- Maintain normal body temperature
- Reassure the victim
- Care for other injuries or conditions

Burns

Burns are classified by depth of injury; the deeper the burn, the more severe it is. Treating burns should be done in such a manner as to relieve pain, prevent infection and prevent or treat for shock.

- First-degree burns redden the skin much like sunburn. Immerse the affected area in cool water or cover it with a cloth soaked in cool water. If necessary apply a dry dressing and cover it with a bandage.
-
- Second degree burns form blisters. Treat in the same manner as first degree burns. Do not break or try to remove any burned tissue. Do not apply any kind of antiseptic sprays or ointments. If possible keep the affected area above the victim's heart. Seek medical treatment as soon as possible.
-
- Third degree burns char and destroy tissue. Call for medical help immediately. Treat for shock if necessary and continue treatment as in second-degree burns.

Broken Bones

A broken bone injury should be immobilized to prevent further injury. Stop bleeding, if there is any, treat for shock and seek medical attention.

Rescue Breathing

If a victim is not breathing they must be attended to immediately. Rescue breathing is used to maintain an airway and cause air to flow in and out of the lungs. Rescue breathing should be continued until the victim can breath for himself or herself or a doctor or other trained person takes responsibility.

CPR You Can Do It!

(Thanks to Mickey S. Eisenberg, M.D., Ph.D. for permission to use this excellent work)

If you believe someone is having a cardiac arrest do not panic. Follow the six simple steps of **CPR** below and help save a life. Remember, these steps are to be used as a guide and a reminder. Please try to attend a **CPR training course** offered by the American Red Cross or American Heart Association.

Call 9-1-1.

Check the victim for unresponsiveness. If there is no response, call 911 and then return to the person.



How To Recognize Cardiac Arrest: During cardiac arrest, the heart stops pumping blood, the blood pressure falls to zero and the pulse disappears. Within 10 seconds of cardiac arrest the person loses consciousness and becomes unresponsive. If you shake or shout at the victim, there will be no response.

Sometimes a person in cardiac arrest may make grunting, gasping or snoring type breathing sounds for a couple of minutes. Do not be confused by this abnormal type of breathing.

If a person is unresponsive (doesn't respond to shouts or shakes) and not breathing (or breathing abnormally) then call 911 and begin CPR.



Tilt head, lift chin: check breathing.

Position the person flat on their back. Kneel by their side and place one hand on the forehead and the other under the chin. Tilt the head back and lift the chin until teeth almost touch. Look and listen for breathing.

Abnormal Breathing - Remember a person in cardiac arrest may have abnormal breathing for a couple of minutes. This abnormal breathing is called agonal respiration and is the result of the brain's breathing center sending out signals even though circulation has ceased. The key point is that the abnormal breathing may sound like grunting, gasping or snoring. It disappears in 2-3 minutes. If you see this type of breathing **DO NOT** delay CPR. The person desperately needs air and only you can provide it.

Give two breaths.

If not breathing normally, pinch the nose and cover the mouth with yours. Give two full breaths. The person's chest will rise if you are giving enough air. If the chest does not rise, open the person's mouth and check for obstructions in the throat.



Check pulse.

Put the fingertips of your hand on the Adam's apple; slide them into the groove next to the windpipe. Feel for a pulse. If you cannot feel a pulse or are unsure, move on to the next step.

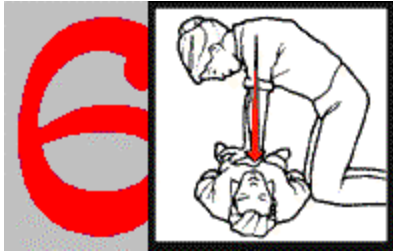
Checking The Pulse

Checking for a pulse is unnecessary in most situations of cardiac arrest. It is usually obvious when a person is in cardiac arrest and thus checking a pulse is not

needed. Furthermore, determining whether a pulse is present is sometimes difficult for individuals. Therefore, if you are unsure about a pulse proceed to the next step.

Position hands.

Position your hands in the center of the chest between the nipples. Place one hand on top of the other.



Pump 15 times.

Push down firmly two inches.
Push on chest 15 times.



Pushing on the Chest

In general the chest should be pushed down 1-2 inches.

Sometimes you may hear a cracking sound. Do not be alarmed. The sound is caused by cartilage or ribs cracking. Even if this occurs the damage is not serious. The risk of delaying CPR or not doing CPR is far greater than the risk of a broken rib.

Continue with two breaths and 15 pumps until help arrives

Rendering Assistance

Be prepared to help others in trouble if at all possible but do not take unnecessary risks that could put your life in danger. Don't panic, have life saving equipment ready and approach the accident carefully. Watch for persons in the water and throw floatation devices to any who do not have any. Talk to the people and assess any injuries they may have.

Administer first aid if necessary and get the people to shore as quickly and safely as possible. Remember; don't overload your own boat with too many people. If necessary take victims requiring the most assistance into the boat and throw a line to the others and tow them slowly as you proceed.

Towing

Towing another vessel safely can be a fairly complex operation. It involves many factors such as:

- Draft of both vessels relative to depth of water.
- Size and weight of other vessel relative to your engine power.
- Skill level of both crews.
- Availability and condition of towing equipment.
- Availability and condition of attachment points on both boats.
- Numbers and condition of crew available on both boats.

The key to safe towing is pre-planning and practice. You should have on board certain minimum equipment to carry out a safe tow.

Responsibility

Maritime tradition has always maintained that all vessels will render assistance to any vessel in distress. In today's litigious world, law has bolstered this tradition. The following laws apply to most towing situations:

- Duties related to marine casualty assistance and information (46 U.S.C. 2303)-

- "(a) The master or individual in charge of a vessel involved in a marine casualty shall- (1) render necessary assistance to each individual affected to save that affected individual from danger caused by the marine casualty, so far as the master or individual in charge can do so without serious danger to the master's or individual's vessel or to individuals on board..."
- "(b) An individual violating this section or a regulation prescribed under this section shall be fined not more than \$1,000 or imprisoned for not more than two years. The vessel is also liable to the United States Government for the fine."
- "(c) An individual complying with subsection (a) of this section or gratuitously and in good faith rendering assistance at the scene of a marine casualty without objection by an individual assisted, is not liable for damages as a result of rendering assistance or for an act or omission in providing or arranging salvage, towage, medical treatment, or other assistance when the individual acts as an ordinary, reasonable, and prudent individual would have acted under the circumstances..."
- Duty to provide assistance at sea (46 U.S.C. 2304)-
- "(a) A master or individual in charge of a vessel shall render assistance to any individual found at sea in danger of being lost, so far as the master or individual in charge can do so without serious danger to the master's or individual's vessel or individual's on board.
- "(b) A master or individual violating this section shall be fined not more than \$1,000 imprisoned for not more than two years, or both. The vessel is also liable to the United States Government for the fine."

Be aware of and comply with your agency policy with regards to towing. As an agency representative in a government boat the "Good Samaritan" rule (46 U.S.C. 2303 (C)) may not apply to your actions (IE. Those with a "duty to act"), however Courts may recognize the following of established policy/procedures as a sign of competency and good faith effort. Remember though, that even if you cannot tow, you are required to assist in the situations mentioned above. Should you undertake a tow, tow only to nearest safe anchorage, harbor, marina, etc.

When to tow

- If immediate threat to life or property exists.
- If equipment, skill level, and environmental conditions warrant that a safe tow can be made.
- If agency policy allows.

When not to tow

- If disabled vessel is sinking, on fire, or somehow a danger to the towing vessel.
- If there is any doubt about safety due to equipment, weather, or skill level of participants.
- If tow is only for the personal convenience of the disabled vessel.
- If agency policy precludes towing as a means of public assistance.

Other Options

- Rescue passengers if situation is life threatening.
- Try and obtain competent assistance capable of handling the situation.

Protect life first, property second

Towing Equipment

- Towline - 75 feet; ½ or ¾ inch; double braid (three-strand or laid rope not recommended); nylon or poly.
- Hooks or Carabiners - ensure breaking strength greater than line.
- Bridles - rig ahead of time; use same line as for towline.
- Miscellaneous - mooring lines, fenders, boat hook, lights, knife or ax.

NOTE: Recommend carrying a pre-rigged tow bag containing needed equipment.

Towing Safety

- Start tows gently.
- Steady pull at reasonable speed (below planing speed) when underway.
- Stay "in step", with both boats on crest of waves at same time.
- Allow a "catenary" or dip in the towline, this will act as a spring, preventing sudden jerks on the line and attachment points.
- Do not stand in line with towline. The line and/or attachment hardware may break and snap back at you.
- Do not fend off with hands/feet while rigging tow- risk of injury exists.
- Consider length of tow when making turns.
- Don't let the disabled boat "rear-end" you.
- Shorten line for more maneuverability if needed, particularly in harbor area. Consider use of "alongside" tow.
- Be ready to cast off or cut towline (emergency breakaway) if disabled vessel starts to sink or endangers you.
- Mark towline along its length with Velcro flags or plastic surveyor ribbon for visibility.
- Move passengers of towed boat to yours only if it can be done safely, and not overload your boat.

Tow Operational Plan

- Survey scene and evaluate conditions.
 - Anchors out, or other hazards in area?
 - Has the operator asked for assistance?
 - Boat to be towed appears in good condition and structurally sound.
- Talk to Operator.
 - Evaluate Skipper.
 - Is s/he sober?
 - Is s/he in control?
- Where does s/he wish to be towed?
- Prepare tow system.
- Give special Instructions to crew of towed boat.
 - All people wearing PFD.
 - All passengers seated in proper area and boat trimmed.
 - Have them de-water their boat as much as possible before initiating tow.
 - Instruct operator to steer with you; or rig outboard motor, or rudder amidships.
 - Have rigged anchor ready to use should towline break.
- Communication between boats.
 - hand signals.
 - radio (VHF or CB).

Towing Points (towed vessel)

- Bow eye best choice if it is in good shape.
- Can use Sampson post.
- On sailboats, can use foremost mast unless it is a "stepped" (removable) mast. Lead towline through chocks or some form of fairlead, then back to the mast. Secure to stanchions or winches to tie off.
- As last resort, use bow cleats, but be careful - most recreational boats are not equipped with adequately reinforced cleats. Requires special rigging.

Towing Points (towing vessel)

- Transom eyebolts (also called "lifting eyes") - usually well built and reinforced (verify to be sure).
- Stern cleats - must be heavy duty, mounted through the deck with reinforced backing. (If in doubt, check with manufacturer.) Standard equipment on some commercial grade vessels.
- Towing bit - best, but not available on most boats.

Securing line to towing points

- When securing to a bow eye or transom eye, use a loop in combination with a carabineer or snap-hook, loops can be tied using a bowline or figure eight on a bight.
- When securing to reinforced cleats, use a loop or standard cleat wrap.

Types of Tows

- Off stern (single rope)
 - Works best on boats equipped with towing bit (other attachments result in unbalanced pull and/or interference with motor on outboards).
 - Need very strong attachment point or towing bit.
 - Easy to rig.
 - Good for long, off shore towing.
 - Good shock absorbency.
 - Length of rope can be changed from towboat.
- Off Stern (single rope with "Y" bridle)
 - Used on Inboard, Outboard, or I/O.
 - Good for long off shore towing.
 - Length can be changed, but with difficulty.
 - Good shock absorbency.
 - Bridle must be very strong (best if pre-made).
 - Need very strong attachment points.
 - Best control when bridle is lead forward of propeller/rudder.
- Off Stern ("V" Bridle)
 - Used on Inboard, Outboard, or I/O.
 - Good control in confined waters.
 - Length can be easily changed from towboat.
 - Distribution of load is good.
 - Not suited for tows requiring long towline.
 - Best control when bridle is lead forward of propeller/rudder.

- Alongside Tow (pusher)
 - Excellent control in confined waters.
 - Should be set up with towed boat on port side of towing vessel so as to not obscure visibility in your boats danger zone.
 - Works well even with only one person for both boats.
 - Works well when other boat cannot be steered.
 - Must have fenders to avoid damage.
 - Does not work well in other than smooth waters.
 - Visibility is impaired.

Approaches- Selection based on conditions.

- Parallel approach (limits maneuverability).
- Crossing the T (works well in moderate to heavy seas).
- 45-degree approach (quickest and best in most cases).
- Back down approach (easy to foul prop).
- Drift approach, use kedge anchor and drift down to boat (usually done if towed boat is aground)

Hooking up

- If bow eye is easily accessible, pass or throw the towline to the disabled operator and have them hook in the carabineer.
- If bow eye is hard to reach, instruct your crewmember to hook up being careful to avoid being "pinched" under the disabled vessel's bow.
- Can use a "kicker hook" to make the job safer and easier.
- If bow eye is not available, may need to put crewmember on board to set up a special rigging using bow cleats. Be careful of weak cleats!

Chapter VII - Special Items

There are many unique types of boats and activities occurring on the water today. A number of these have additional legal and safety requirements that have been established to ensure safe boating conditions on the water. Many of these additional requirements are mandated under state or local law.

Personal Watercraft

A Personal Watercraft (PWC) is defined as a vessel which uses an inboard motor powering a water jet pump as the primary source of motive power, and which is designed to be operated by a person sitting, standing, or kneeling on the vessel, rather than the conventional manner of sitting or standing inside the vessel. It is not a toy. If you operate one, you have the responsibility of knowing and obeying boating regulations and practicing boating safety.

The U. S. Coast Guard classifies personal watercraft, PWC, as inboard boats. That means personal watercraft are subject to the same rules and requirements as any other powerboat plus additional requirements specific to PWC. PWC operators are involved in a disproportionate number of accidents nationwide. The main reason is the inability to steer the craft when power is lost.

Characteristics

- Jet pump propulsion, no rudder or exposed propeller.
- Operator sits, stands or kneels on top of hull.
- Lose ability to maneuver when engine stops or throttle is released.
- Shallow draft, as little as two feet of water.
- Fuel tanks directly under seat.
- Equipped with kill switch.

Legal requirements- Most of these are state specific rules; refer to those on file in the state you are operating in.

- Operators of PWC must obey the same rules as other motorboats.
- PFD requirements (usually all on board and/or being towed must be wearing one).
- Age to rent and operate.
- Times to operate (usually illegal after sunset, they are not equipped with navigational lights).
- Kill switch lanyard use required?
- Water Skiing permitted?
- Equipment requirements and use. Fire extinguishers, sound producing device, numbers and registration (carry on board) required?

In addition to the general regulations in effect for motorboats, PWC owners must also be aware that there are local laws and ordinances around the country that further restrict PWC operations. They include age of the operator, sunrise to sunset limitations, special no wake zone provisions, assigned operating areas and restrictions, and speed limits and distance requirements. Check with state and local officials to make certain you know the laws that apply to you in your area of operation. For example, some states prohibit wake jumping or require no-wake speed when within 100 feet of the shoreline.

Federal Regulations require that all personal watercraft be registered and display a registration number in accordance with state and federal guidelines.

Properly fitted, CG approved personal flotation devices (life jackets) are required for each person on board, and in most states they are required to be worn. The PFD should have an impact

rating equal to, or better than, the PWC maximum speed. There must also be a CG approved, Class B-1 fire extinguisher aboard the PWC.

Many PWC have a lanyard connected to the start/stop switch. If your PWC is equipped with such a switch, it will not start unless the lanyard is attached to it. Never start your engine without attaching the lanyard to your wrist or PFD. If you fall off, the engine automatically stops running so your craft will not travel a great distance and you can easily swim to it. It will prevent the PWC from running unattended in areas populated by swimmers or other watercraft.

PWC operators need to keep in mind that a jet drive requires moving water through the drive nozzle for maneuverability. If you approach a dock, shore, or other vessel at a rapid speed and shut off the engine, you will have little or no maneuvering capability.

The Personal Watercraft Industry Association (PWIA) also recommends that the operator wear eye protection, a wetsuit, footwear, and gloves.



The vast majority of PWC operators are responsible boaters. They are considerate of the environment, obey the law, and respect the rights of others to enjoy our waterways. Most complaints to law enforcement officials regarding the operation of PWCs fall into the following categories. If you are a mature and conscientious operator, try and avoid these breaches of common courtesy and consideration.

- Wake jumping! This is not only irritating to boaters attempting to be watchful and maneuver in heavily congested areas, but it is extremely dangerous. In one case, a wake-jumper in Florida got tangled up in the props of a cabin cruiser and was killed.
- No wake zones! If you want to get on the wrong side of a responsible boater, disobey no wake zones. You are likely to find yourself with a ticket, since most boaters and shoreline property owners will not hesitate to report violators of slow-no-wake areas.
- High speeds too near shore or other boats! Most states require 100-200 feet of separation between boats and the shore when moving at more than no-wake speeds. (No wake means the slowest possible speed your boat will go and still provide maneuverability.)
- Noise! Excessive noise near shore or near anchored boats is sure to draw negative attention. Be considerate of property owners and other boaters.
- There are environmental issues that PWC operators need to consider as well:
- Pollution! Refuel on land to reduce chances of spillage into the water. Don't overfill your fuel tank. Check and clean your engine well away from shorelines.
- Turbidity! In shallow waters where PWCs can easily operate, the bottom gets stirred up, suspending sediment that cuts down on light penetration and depletes oxygen. This can affect bird and fish feeding. To avoid this, operate your PWC in deeper water. If you do have to traverse shallow water, run at idle speed.
- Vegetation! In coastal areas be aware of low tide. Low water levels expose sea grass beds and other delicate vegetation. Disturbances can cause erosion and long lasting damage. As a side effect, ingesting seaweed and sea grass is not good for your engine. Feed it clean water and it will run and maneuver much better.

- Wildlife harassment! A PWC near shore can interrupt feeding and nesting wildlife, and cause animals to deviate from their normal behavior. And that, by law, is illegal. Mammals such as otters, manatees, and whales can be injured by direct contact with a boat, and it is believed that the noise from watercraft can even adversely influence breeding cycles and cause birth defects. So avoid areas of high animal populations.

Remember, our waterways belong to everybody. If all boaters act responsibly and courteously, obey the rules, and protect the environment, our seas, lakes and rivers will provide all of us a lifetime of enjoyment and recreation.

Water Sports

Many people who operate boats do not consider themselves "boaters," because boating is only incidental to their major activity. In fact, everyone who is in a boat is a boater, whether the reason is to fish, hunt, or just drift around.

Hunting and Fishing

A number of hunters and fishermen drown each year, simply because they do not act as responsible boaters. In fact they don't consider themselves boaters. They typically use boats as platforms from which to fish or hunt. They overload the boat, stand up, don't wear PFDs or fail to take other precautions required when boating. Often alcohol and hypothermia are involved. A person who stands in a boat does not have the same balance as someone sitting down. A person who fires a gun while standing may easily lose balance and fall overboard.



DON'T operate around boaters who are hunting. Generally hunters don't want to be around other boaters any more than other boaters want to be around those hunting from boats. As a rule, if you see someone in a boat who appears to be hunting just keep clear.

When operating around boaters who are fishing, take extra care to control your wake. People often stand up in their boat to cast or reel in a fish. Your wake could tip the boat and cause someone to fall overboard. Remember you are responsible for your wake.

If you are the boater who is fishing, remember never to anchor in narrow channels or shipping lanes and do not tie up to aides to navigation.

Swimming



Always swim close to shore and avoid areas where boating is heavy. Do not swim alone away from the boat. It might be a good idea to tie a line to the boat with a life ring or type four throwable device attached. A tired swimmer could reach this and he or she could pull themselves back to the boat. Be sure to get the line back on board prior to getting underway to avoid getting it fouled in your prop.

Be alert for swimmers in the water. Don't assume that they will always restrict themselves to designated swim areas. Be particularly careful when approaching an anchored or drifting boat. There may be swimmers in the area.

Diving

You may run across boats engaged in diving operations almost anywhere so keep a sharp lookout and scan the water ahead of you. Boats engaged in diving should show a rigid replica of the internationally recognized "Alpha Flag". This is a blue and white flag with a swallow tail. Additionally, the traditionally used "Divers Down" flag should be flown from the boat or from a float over the divers. This red flag with a diagonal white stripe should be easily seen on the water.



If you spot either or both of these flags keep well clear (at least 100 to 300 feet depending upon state law. Check your state laws.). Also watch carefully for bubbles breaking the surface. It could indicate that a diver has strayed from the area and may not be near the dive boat.

Boardsailing



This relatively new but exciting sport has become more and more popular over the past few years. It, like all other on-the-water activities, can have its dangers.

You first learn the concepts of board sailing from an experienced instructor. When you are just beginning to venture into the water do so in a small confined area in light weather. Heavy winds may be fun for speed but the effort it may take to get you back to the place you started may be exhausting. Don't overdo it.

Be sure to have a tether attached to the board in case you fall off. This allows you to get to the board prior to its drifting away from you, possibly faster than you can swim. Wear a USCG approved PFD when

board sailing even if you are a good swimmer. Because of the strenuous nature of the sport you may become exhausted easily and you could get cramps that interfere with swimming. If you find yourself tiring, take down the sail; furl it around the mast, lie on the board and paddle back to safe harbor.

Water Skiing and Similar Activities

Fast becoming one of the most popular sports in the nation, water skiing also has certain aspects of danger. First, it should be a team sport. The team players are the skier, the boat driver and an observer to keep an eye on the skier and relay messages to the driver. The boat should also be equipped with a wide-angle rear view mirror so the driver can see the skier.



Skiing includes tubing, knee boarding, and similar activities. Beginners should take lessons from an experienced individual. It requires athletic ability by skier, an experienced boat operator, and a vigilant observer.

Many states require that there be a water skier observer and often there are age restrictions. Check your state specific information for these regulations as well as permissible hours of operation, any speed and distance requirements and PFD wearing requirements.

Be sure to follow all normal operating procedures and stay well clear of other boats, docks and obstacles. Since the towrope should be at least 75 feet long remember to keep the skier at least twice that distance from potentially dangerous obstacles.

The water skier should be able to communicate to the towing boat with hand signals. A clear understanding in advance of the desires of the skier will lead to a safer sport. Try not to think for the skier, let him or her direct the actions of the boat.

Do not water ski after dark. It is very dangerous and against the law. Many states have rules regarding when you can water ski. Check your state specific information.

Alcohol and Controlled Substances



One-third of all boating fatalities are alcohol related. It is illegal to operate a boat, or to permit others to do so, while under the influence of alcohol, narcotics, or barbiturates. Penalties are severe and could include fines up to \$5000, imprisonment of up to one year, non-paid public service work, and mandatory substance abuse counseling. If an operator under the influence kills or seriously injures another person the penalty can be up to five years in prison and a fine of up to \$5000.

Some states have additional penalties, and the legal limit varies by state, so check your state laws for details.

Alcohol can decrease a person's ability to handle a boat in many ways. As a depressant, alcohol goes straight to the nerves, blood stream, and the brain. As recreational boaters it is hard enough to remember all the rules, regulations, boat handling techniques, etc. while lucid. A few beers to quench the thirst in a rapidly dehydrating body and the following happens:

Eroding sense of balance - Most boating deaths result from falling out of a small open boat, without a PFD, whether it capsizes or not.

Vision fades - Because of the sun and reflection of light, objects on the water can be hazy and difficult to see. Color perception and peripheral vision deteriorate and at night depth perception decreases. You can imagine what happens if you can't distinguish between the red and green markers or red and green lights of an oncoming vessel at night.

Coordination suffers - Should a person fall into the water they may have trouble just floating, let alone grasping onto a life ring or throwable device. Add the shock of the cold water and the risk of cramping and drowning is increased significantly.

Surface blood vessels dilate - Blood vessels on the surface of the skin dilate to increase the rate of body heat loss while in the sun. If, while these vessels are dilated, you fall overboard into cold water hypothermia sets in quickly and this further reduces your decision-making abilities.

Judgment is impaired - One of the things that drinking tends to do is to make you begin to lose your judgment. After a drink or two people tend to become relaxed and are more likely to perform dangerous acts that they might not normally do if not under the influence. Because their judgment is impaired they may not even realize they are doing something dangerous. This, combined with the other debilitating symptoms previously covered, spells disaster.

Environmental stressors - Natural stressors such as exposure to sun, glare, wind, noise, vibration, and motion on the water produces "boater's hypnosis" or fatigue. This in itself reduces reaction time almost as much as being under the influence. Adding alcohol to these environmental stressors intensifies their effects.

Vessel Emergency Repairs

Proper care and preventive maintenance on your boat will eliminate many emergency repairs. It is the nature of boats, however, to break down when you least want them to. Being innovative in your approach to repairs is essential.

A few, well-suited hand tools such as wrenches, screwdrivers, a hammer, vise-grips and pliers should be in your tool kit. Many marine stores sell tool kits in waterproof, floating boxes that are small, compact and convenient. You should also have a selection of basic spare parts. These should include belts, spark plugs, points, assorted hoses, fuel filters, impellers, etc.

Remember, when making repairs do not stand up in your boat. The wake of a passing boat while you are disabled and not paying attention could cause you to go overboard.

The following are some examples of emergency repairs.

- If your engine stalls, start from the obvious and work toward the more complicated solution.
- Do you have fuel?
- Have you run aground?
- Has the propeller fouled with line?
- Is the engine overheated due to no water flow?

Should you have a broken drive belt and not have a spare you can fashion one temporarily from some small line, the drawstring from a bathing suit or a pair of ladies hose. Tie the ends together tightly with a square knot.

If you are losing engine oil, find the leak, catch the oil in a container and continue to pour back into the engine until you can fix the leak. You can repair a broken hose or pipe with rags or a tee shirt tied tightly with a line or a belt. Or duct tape may work.

If you find you are taking on water, first find the source. You should carry on board assorted sizes of tapered wooden plugs or bungs. If the water is coming from a through hull opening or small hole use the appropriate plug to jam into the opening. If the hole is large, use pillows, clothing, or blankets to stuff the damaged area.

Security

Protect your boat against theft by securing it properly. The following suggestions should be followed:

- Never leave the keys in the boat when unattended.
- If you must leave your boat unattended in the water for an extended time period, you might consider taking the fuel line from the portable tank with you.
- You might also consider removing the battery.
- If your boat is on a trailer, install a trailer hitch lock so the trailer can't be towed or take one wheel off the trailer and store it in your towing vehicle.
- Keep all equipment stored out of sight or take it with you.
- Paint the name on the transom of your boat.
- Make sure you record your HIN number and keep it in a safe place

Sailing



Propelling boats with sails has been going on for thousands of years. In the old days the sailors had very little control and most sailing was done downwind or with the wind pushing on the sails in order to move the boat. More recent technologies have made sailing, especially racing, much more controlled and allows boats to sail closer and closer to the wind.

As a rule of thumb, a recreational vessel probably will only be able to sail in areas that are at least 45 degrees of the wind on either side of the direction from which the wind is blowing. This is called the "no go zone" and to get to a location upwind you have to do a maneuver called a tack. This back and forth maneuver with the bow going through the wind and the sails being transferred from one side to the other eventually gets you to your upwind mark.

How Do Boats Sail?

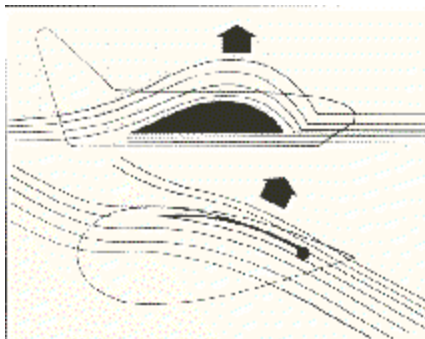
A sailboat has four basic components that allow it to sail. They are the hull, the sail(s), the keel or centerboard, and the rudder.

The hull is obviously designed to carry crew, equipment, rigging (mast, spars, etc.) and move through the water with ease.

The sails actually provide the force to make the boat move through the water.

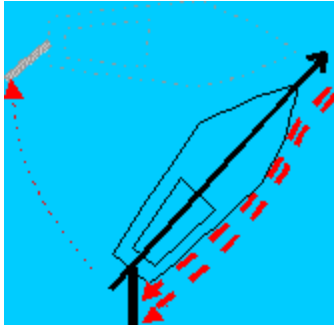
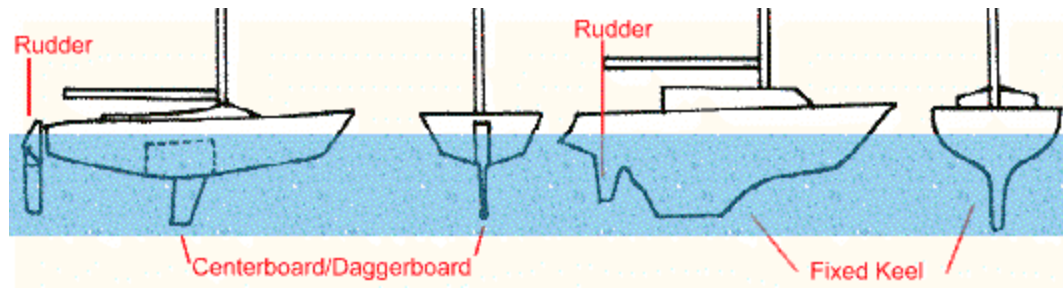
To imagine a sailboat going away from the wind or having the wind push on the sails is fairly straightforward. It is more difficult, however, to understand how a boat sails toward the wind. In actuality sailboats cannot sail directly into the wind.

As mentioned above there is a "no go zone" in which the sails provide no power to move the boat; they simply flap in the wind.



The force that the wind transfers to the sails actually makes a boat move forward for much the same reason a plane flies. If you were to look down on a sailboat from a helicopter you would see what looks like an airplane's wing except standing on end. The air moving across the sails, like air moving across an airplane wing, creates lift.

The keel or centerboard keeps the boat from being pushed sideways by the wind. The resistance from the hull and the keel translate the lift to forward motion. You do also get some sideways motion or leeway.

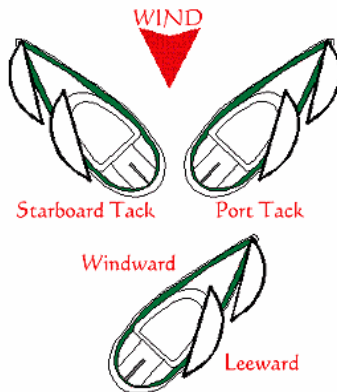


The rudder is used to steer the boat. You may have an extension attached to the rudder called a tiller. When the tiller is moved to one side the rudder moves and the force of water flowing over the rudder causes the boat to turn. You should remember that on boats with tillers you must push the tiller in the opposite direction that you want to turn. On larger sailboats with wheel steering the boat turns the same way that the wheel is turned.

Each direction that a sailboat sails has a name that describes it. All sailing terminology has been developed in order to quickly and succinctly communicate with the crew what procedures should be performed in order to sail the boat effectively. The closer to the wind the boat comes the tighter the sails. Conversely, the further off the wind, the looser the sails.

Rules of the Road

In order to understand the rules of the road as they pertain to sailboats you must know a little more sailing terminology.

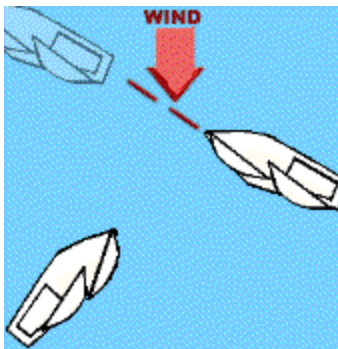


Port tack - when the wind is coming over the port side of the boat
Starboard tack - when the wind is coming over the starboard side of the boat

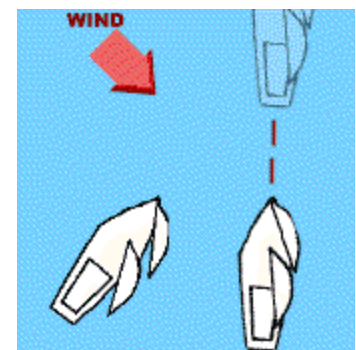
Windward - in the direction from which the wind is coming (upwind)

Leeward - in a direction away from which the wind is coming (downwind)

When sailboats approach one another under sail, the "give-way" vessel must stay clear of the "stand-on" vessel. The following rules determine which boat is the "give-way" and must yield the right-of-way in any situation where the danger of collision exists.



If both boats are on opposite tacks, the boat on the port tack gives-way to the boat on the starboard tack.



If both boats are on the same tack, the boat to windward must keep out of the way of the boat to leeward. In other words the boat farthest from the direction from which the wind is blowing has the right-of-way.

Generally, sailboats have the right-of-way over powerboats unless the sailboat is overtaking another vessel. In that case the sailboat becomes the "give-way" boat. Additionally, if a sailboat has mechanical propulsion and it is being used the sailboat, even while still under sail, is suddenly a powerboat and must obey the same rules as other powerboats.

Even though a sailboat may have the right of way over a powerboat some common sense must be used. For instance, you should not impede the passage of large powerboats and you should not change course when approaching powerboats. Changing course only makes it harder for the powerboat to pass safely.

Motorboat Operator Certification Course Glossary of Terms

ABAFT - Toward the rear (stern) of the boat. Behind.

ABEAM - At right angles to the keel of the boat, but not on the boat.

ABOARD - On or within the boat.

ABOVE DECK - On the deck (not over it - see ALOFT)

ABREAST - Side by side, by the side of.

ADRIFT - Loose, not on moorings or towline.

AFT - Toward the stern of the boat.

AGROUND - Touching or fast to the bottom.

AHEAD - In a forward direction.

AIDS TO NAVIGATION - Artificial objects to supplement natural landmarks indicating safe and unsafe waters.

ALEE - Away from the direction of the wind. Opposite of windward.

ALOFT - Above the deck of the boat.

AMIDSHIPS - In or toward the center of the boat.

ANCHORAGE - A place suitable for anchoring in relation to the wind, seas and bottom.

ASTERN - In back of the boat, opposite of ahead.

ATHWARTSHIPS - At right angles to the centerline of the boat, rowboat seats are generally athwart ships.

AWEIGH - The position of anchor as it is raised clear of the bottom.

BATTEN DOWN - Secure hatches and loose objects both within the hull and on deck.

BEAM - The greatest width of the boat.

BEARING - The direction of an object expressed either as a true bearing as shown on the chart, or as a bearing relative to the heading of the boat.

BELOW - Beneath the deck.

BIGHT - The part of the rope or line, between the end and the standing part, on which a knot is formed. BILGE - The interior of the hull below the floor boards.

BITTER END - The last part of a rope or chain. The inboard end of the anchor rode.

BOAT - A fairly indefinite term. A waterborne vehicle smaller than a ship. One definition is a small craft carried aboard a ship.

BOAT HOOK - A short shaft with a fitting at one end shaped to facilitate use in putting a line over a piling, recovering an object dropped overboard, or in pushing or fending off.

BOOT TOP - A painted line that indicates the designed waterline.

BOW - The forward part of a boat.

BOW LINE - A docking line leading from the bow.

BOWLINE - A knot used to form a temporary loop in the end of a line.

BRIDGE - The location from which a vessel is steered and its speed controlled. "Control Station" is really a more appropriate term for small craft.

BRIDLE - A line or wire secured at both ends in order to distribute a strain between two points.

BRIGHTWORK - Varnished woodwork and/or polished metal.

BULKHEAD - A vertical partition separating compartments.

BUOY - An anchored float used for marking a position on the water or a hazard or a shoal and for mooring.

BURDENED VESSEL - That vessel which, according to the applicable Navigation Rules, must give way to the privileged vessel. The term has been superseded by the term "give-way".

CABIN - A compartment for passengers or crew.

CAPSIZE - To turn over.

CAST OFF - To let go.

CATAMARAN - A twin-hulled boat, with hulls side by side.

CHAFING GEAR - Tubing or cloth wrapping used to protect a line from chafing on a rough surface.

CHART - A map for use by navigators.
CHINE - The intersection of the bottom and sides of a flat or v-bottomed boat.
CHOCK - A fitting through which anchor or mooring lines are led. Usually U-shaped to reduce chafe.
CLEAT - A fitting to which lines are made fast. The classic cleat to which lines are belayed is approximately anvil-shaped.
CLOVE HITCH - A knot for temporarily fastening a line to a spar or piling.
COAMING - A vertical piece around the edge of a cockpit, hatch, etc. to prevent water on deck from running below.
COCKPIT - An opening in the deck from which the boat is handled.
COIL - To lay a line down in circular turns.
COURSE - The direction in which a boat is steered.
CUDDY - A small shelter cabin in a boat.
CURRENT - The horizontal movement of water.

DEAD AHEAD - Directly ahead.
DEAD ASTERN - Directly aft.
DECK - A permanent covering over a compartment, hull or any part thereof.
DINGHY - A small open boat. A dinghy is often used as a tender for a larger craft.
DISPLACEMENT - The weight of water displaced by a floating vessel, thus, a boat's weight.
DISPLACEMENT HULL - A type of hull that plows through the water, displacing a weight of water equal to its own weight, even when more power is added.
DOCK - A protected water area in which vessels are moored. The term is often used to denote a pier or a wharf.
DOLPHIN - A group of piles driven close together and bound with wire cables into a single structure.
DRAFT - The depth of water a boat draws

EBB - A receding current.

FATHOM - Six feet.
FENDER - A cushion, placed between boats, or between a boat and a pier, to prevent damage.
FIGURE EIGHT KNOT - A knot in the form of a figure eight, placed in the end of a line to prevent the line from passing through a grommet or a block.
FLARE - The outward curve of a vessel's sides near the bow. A distress signal.
FLOOD - A incoming current.
FLOORBOARDS - The surface of the cockpit on which the crew stand.
FLUKE - The palm of an anchor.
FOLLOWING SEA - An overtaking sea that comes from astern.
FORE-AND-AFT - In a line parallel to the keel.
FOREPEAK - A compartment in the bow of a small boat.
FORWARD - Toward the bow of the boat.
FOULED - Any piece of equipment that is jammed or entangled, or dirtied.
FREEBOARD - The minimum vertical distance from the surface of the water to the gunwale.

GALLEY - The kitchen area of a boat.
GANGWAY - The area of a ship's side where people board and disembark.
GEAR - A general term for ropes, blocks, tackle and other equipment.
GIVE-WAY VESSEL - A term used to describe the vessel that must yield in meeting, crossing, or overtaking situations.
GRAB RAILS - Handhold fittings mounted on cabin tops and sides for personal safety when moving around the boat.

GROUND TACKLE - A collective term for the anchor and its associated gear.

GUNWALE - The upper edge of a boat's sides.

HARD CHINE - An abrupt intersection between the hull side and the hull bottom of a boat so constructed.

HATCH - An opening in a boat's deck fitted with a watertight cover.

HEAD - A marine toilet. Also the upper corner of a triangular sail.

HEADING - The direction in which a vessel's bow points at any given time.

HEADWAY - The forward motion of a boat. Opposite of sternway.

HELM - The wheel or tiller controlling the rudder. HELMSPERSON - The person who steers the boat.

HITCH - A knot used to secure a rope to another object or to another rope, or to form a loop or a noose in a rope.

HOLD - A compartment below deck in a large vessel, used solely for carrying cargo.

HULL - The main body of a vessel.

INBOARD - More toward the center of a vessel; inside; a motor fitted inside a boat.

INTRACOASTAL WATERWAY - ICW: bays, rivers, and canals along the coasts (such as the Atlantic and Gulf of Mexico coasts), connected so that vessels may travel without going into the sea.

JACOBS LADDER - A rope ladder, lowered from the deck, as when passengers come aboard.

JETTY - A structure, usually masonry, projecting out from the shore; a jetty may protect a harbor entrance.

KEEL - The centerline of a boat running fore and aft; the backbone of a vessel.

KNOT - A measure of speed equal to one nautical mile (6076 feet) per hour.

KNOT - A fastening made by interweaving rope to form a stopper, to enclose or bind an object, to form a loop or a noose, to tie a small rope to an object, or the ends of two ropes together.

LATITUDE - The distance north or south of the equator measured and expressed in degrees.

LAZARETTE - A storage space in a boat's stern area.

LEE - The side sheltered from the wind.

LEEWARD - The direction away from the wind. Opposite of windward.

LEEWAY - The sideways movement of the boat caused by either wind or current.

LINE - Rope and cordage used aboard a vessel.

LOG - A record of courses or operation. Also, a device to measure speed.

LONGITUDE - The distance in degrees east or west of the meridian at Greenwich, England.

LUBBER'S LINE - A mark or permanent line on a compass indicating the direction forward parallel to the keel when properly installed.

MARLINSPIKE - A tool for opening the strands of a rope while splicing.

MIDSHIP - Approximately in the location equally distant from the bow and stern.

MOORING - An arrangement for securing a boat to a mooring buoy or a pier.

NAUTICAL MILE - One minute of latitude; approximately 6076 feet - about 1/8 longer than the statute mile of 5280 feet.

NAVIGATION - The art and science of conducting a boat safely from one point to another.

NAVIGATION RULES - The regulations governing the movement of vessels in relation to each other, generally called steering and sailing rules.

OUTBOARD - Toward or beyond the boat's sides. A detachable engine mounted on a boat's stern.

OVERBOARD - Over the side or out of the boat.

PIER - A loading platform extending at an angle from the shore.

PILE - A wood, metal or concrete pole driven into the bottom. Craft may be made fast to a pile; it may be used to support a pier (see PILING) or a float.

PILING - Support, protection for wharves, piers etc.; constructed of piles (see PILE)

PILOTING - Navigation by use of visible references, the depth of the water, etc.

PLANING - A boat is said to be planing when it is essentially moving over the top of the water rather than through the water.

PLANING HULL - A type of hull shaped to glide easily across the water at high speed.

PORT - The left side of a boat looking forward. A harbor.

PRIVELEGED VESSEL - A vessel that, according to the applicable Navigation Rule, has right-of-way (this term has been superseded by the term "stand-on").

QUARTER - The sides of a boat aft of amidships.

QUARTERING SEA - Sea coming on a boat's quarter.

RODE - The anchor line and/or chain.

ROPE - In general, cordage as it is purchased at the store. When it comes aboard a vessel and is put to use it becomes line.

RUDDER - A vertical plate or board for steering a boat.

RUN - To allow a line to feed freely.

RUNNING LIGHTS - Lights required to be shown on boats underway between sundown and sunup.

SATELLITE NAVIGATION - A form of position finding using radio transmissions from satellites with sophisticated on-board automatic equipment.

SCOPE - Technically, the ratio of length of anchor rode in use to the vertical distance from the bow of the vessel to the bottom of the water. Usually six to seven to one for calm weather and more scope in storm conditions.

SCREW - A boat's propeller.

SCUPPERS - Drain holes on deck, in the toe rail, or in bulwarks or (with drain pipes) in the deck itself.

SEA COCK - A through hull valve, a shut off on a plumbing or drain pipe between the vessel's interior and the sea.

SEAMANSHIP - All the arts and skills of boat handling, ranging from maintenance and repairs to piloting, sail handling, marlinespike work, and rigging.

SEA ROOM - A safe distance from the shore or other hazards.

SEAWORTHY - A boat or a boat's gear able to meet the usual sea conditions.

SECURE - To make fast.

SET - Direction toward which the current is flowing.

SHIP - A larger vessel usually thought of as being used for ocean travel. A vessel able to carry a "boat" on board.

SLACK - Not fastened, loose. Also, to loosen.

SOLE - Cabin or saloon floor. Timber extensions on the bottom of the rudder. Also the molded fiberglass deck of a cockpit.

SOUNDING - A measurement of the depth of water.
SPRING LINE - A pivot line used in docking, undocking, or to prevent the boat from moving forward or astern while made fast to a dock.
SQUALL - A sudden, violent wind often accompanied by rain.
SQUARE KNOT - A knot used to join two lines of similar size. Also called a reef knot.
STANDING PART - That part of a line which is made fast. The main part of a line as distinguished from the bight and the end.
STAND-ON VESSEL - That vessel which has right-of-way during a meeting, crossing, or overtaking situation.
STARBOARD - The right side of a boat when looking forward.
STEM - The forward most part of the bow.
STERN - The after part of the boat.
STERN LINE - A docking line leading from the stern.
STOW - To put an item in its proper place.
SWAMP - To fill with water, but not settle to the bottom.

THWARTSHIPS - At right angles to the centerline of the boat.
TIDE - The periodic rise and fall of water level in the oceans.
TILLER - A bar or handle for turning a boat's rudder or an outboard motor.
TOPSIDES - The sides of a vessel between the waterline and the deck; sometimes referring to onto or above the deck.
TRANSOM - The stern cross-section of a square sterned boat.
TRIM - Fore and aft balance of a boat.

UNDERWAY - Vessel in motion, i.e., when not moored, at anchor, or aground.

V BOTTOM - A hull with the bottom section in the shape of a "V".

WAKE - Moving waves, track or path that a boat leaves behind it, when moving across the waters.
WATERLINE - A line painted on a hull which shows the point to which a boat sinks when it is properly trimmed (see BOOT TOP).
WAY - Movement of a vessel through the water such as headway, sternway or leeway.
WINDWARD - Toward the direction from which the wind is coming.

YACHT - A pleasure vessel, a pleasure boat; in American usage the idea of size and luxury is conveyed, either sail or power.
YAW - To swing or steer off course, as when running with a quartering sea.

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Part 485: Safety and Occupational Health Program

Chapter 22: Watercraft Safety

Originating Office: Office of Managing Risk and Public Safety

485 DM 22

22.1 Purpose. To establish minimum requirements for the safe operation of Department of the Interior watercraft and other non-motorized boats, and for the training and certification of Departmental watercraft operators.

22.2 References.

- A. 33 CFR, Navigation and Navigable Waters, Subchapter S, Boating Safety.
- B. 46 CFR 2, Shipping, U.S. Coast Guard, Department of Transportation, Requirements.
- C. 410 DM, Department of the Interior Property Management Regulations.

22.3 Definitions.

- A. Motorboat. Any watercraft 65 feet or less in length, that does not require Guard license or certification to operate.
- B. Operator. The individual in physical control of the watercraft.
- C. Motorboat Classifications:
 - (1) Class A. Motorboat less than 16 feet in length.
 - (2) Class 1. Motorboat 16 feet to less than 26 feet in length.
 - (3) Class 2. Motorboat 26 feet to less than 40 feet in length.
 - (4) Class 3. Motorboat 40 feet to 65 feet in length.

D. Watercraft. Boats and ships, collectively, including air boats, sailboats, and every description of watercraft, except seaplanes, which are used or capable of being used, as a means of transportation on water; and are propelled by machinery whether or not such machinery is the principle source of propulsion.

22.4 Requirements. Bureaus engaged in watercraft operations will establish a watercraft safety program that includes the following minimum requirements:

- A. Safe Watercraft Operation.

(1) Departmental watercraft will be operated in a safe and prudent manner and in accordance with recognized Federal, State, and local laws and standards, in addition to the requirements of this Chapter.

(2) Departmental watercraft will meet or exceed applicable U.S. Coast Guard design/equipment requirements.

(3) In addition to basic safety devices required by local, State, or Federal regulations, Departmental watercraft will be outfitted, based on expected conditions, with other equipment necessary for safe operation. This may include communications gear, navigation aids, and Satnav. Special consideration should be given for the use of emergency location devices such as Emergency Position Indicator Radio Beacon or personal locator beacons. Use of these devices is highly recommended where situations may warrant.

(4) Operators of Departmental watercraft shall be adequately trained, properly tested and certified, prior to official operation of any Departmental watercraft. Certification will be in accordance with Section 22.5 of this Chapter. Prior to certification, employees may practice motorboat operation under the supervision of a certified operator aboard the watercraft. Motorboat operation by non-certified employees will only be used to gain experience prior to completing the necessary training requirements and being certified.

(5) On Class A or Class I vessels, all persons must wear a U.S. Coast Guard-approved personal flotation device (PFD) at all times while on board. On Class 2 or Class 3 vessels, all persons must wear U.S. Coast Guard approved PFDs at all times when on an open space such as the deck, and at the discretion of the vessel operator at other locations on the vessel.

(6) PFDs will be international orange in color and equipped with retro reflective tape in accordance with 46 CFR 25.25-15. (See Appendix 3 of this Chapter.)

(7) Deviation from the requirements of Section 22.4A(6) of this Chapter may be permitted if special mission requirements, such as may be involved in special law enforcement operations, cannot be otherwise satisfied. Deviations must be authorized in writing by the supervisor of the organizational unit conducting the operation prior to the conduct of the activity. The written authorization will identify alternate safety measures to be taken. Deviations will be authorized on a case-by-case basis except where they have the concurrence of a regional (or equivalent) safety manager. In those cases, the deviation may be authorized for a period not to exceed one year. Deviation from other requirements of this Chapter is not permitted.

(8) Cold-water protective equipment, such as exposure suits and/or immersion suits, will be provided where cold-water conditions pose a hazard during watercraft operations. All personnel on board will be trained in the use of this equipment.

(9) Periodic inspection and maintenance programs will be established for all Departmental watercraft, as required by reference identified in Section 22.2C of this Chapter. Records of inspections and maintenance will also be kept in accordance with Section 22.2C.

(10) Departmental employees operating watercraft subject to U.S. Coast Guard licensing regulations will be licensed in accordance with the requirements of reference identified in Section 22.2B of this Chapter, notwithstanding the general exemption of Federal titled watercraft under that reference. Departmental watercraft will meet the applicable U.S. Coast Guard inspection and certification requirements.

B. Operator Training and Certification.

(1) Operators of Departmental watercraft will be trained in safe watercraft operation in accordance with the requirements of this Chapter.

(a) Operators of all motorboats, other than those requiring U.S. Coast

Guard licensed operators (see reference identified by Section 22.4B(1)(b) of this Chapter), will successfully complete the Motorboat Operator Certification Course (MOCC) training requirements specified in Section 22.5C and Appendix 2 of this Chapter. All current operators will be trained and certified in accordance with these requirements.

(b) Operators of watercraft covered by U.S. Coast Guard requirements identified in Section 22.2A will complete all training and certification requisites for operation of those vessels.

(2) Motorboat operator certification will be valid for a period of five years, except that operators certified before October 1, 1995, will remain certified until October 1, 1999. Prior to recertification, operators will complete an 8-hour refresher course that addresses the minimum subject areas described in Section 2.4 of Appendix 2 of this Chapter.

(3) Operators of non-motorized boats are exempted from the requirements of Section 22.5 below. However, they must receive alternate appropriate training necessary for the safe operation of these boats, as determined by the bureau safety manager.

22.5 Training and Certification.

A. The Office of Managing Risk and Public Safety, in coordination with the bureaus, will develop and maintain standards for the Motorboat Operator Instructor Certification Course (MOICC), the MOCC, and the 8-hour refresher training.

B. Appendix 1 outlines the MOICC standards. Employees successfully completing the MOICC will be authorized to present the MOCC and to certify individuals to operate Departmental watercraft. Completion of the MOICC satisfies the requirements of Section 22.4B(1)(a) of this Chapter.

C. Appendix 2 outlines the authorized local MOCC standards. Appendix 2 details minimum requirements only; bureaus should add additional modules meeting specific bureau and local needs. Individuals successfully completing the MOCC will be certified for operation of Departmental watercraft. This course is to be instructed by persons trained in the MOICC as described in Appendix 1 of this Chapter. Training materials will be developed by the Department and distributed to bureaus as necessary for reproduction and use.

D. Other watercraft training programs may be substituted for the Departmental MOCC. Requests for substitution must be submitted to the bureau safety manager or, at his or her discretion, the bureau designated responsible person identified in Section 22.5E. Substituted training must demonstrate that it will meet the MOCC objectives, including on-water proficiency. (See Appendix 2.) Examples of acceptable training are the U.S. Army Corps of Engineers Boat Operators Training Course and the Federal Law Enforcement Training Center (FLETC) Marine Law Enforcement Training Program.

E. (1) Each bureau with watercraft operations will designate an individual as the responsible person for all watercraft training and certification activities within the organization. This individual will help coordinate watercraft safety activities and operator certification functions, and serve as a program point of contact with other bureaus and the Department. That individual must have successfully completed the Departmental approved 40-hour MOICC as outlined in Appendix 1. For implementation of this Chapter, this individual must complete the training prior to October 1, 1996. Additional instructors will be designated, as necessary to assist in motorboat operator certification training. All instructors must complete the Departmental MOICC.

(2) Watercraft Safety Work Group. A Departmental standing Watercraft Safety Working Group will be established to serve as a forum for peer group discussion of watercraft safety issues, and to provide policy and program recommendations and other input to the Department of the Interior Safety and Occupational Health Council. The work group membership will consist of the bureau coordinators identified in Section 22.5E(1) above, in addition to other designated individuals. The work group will meet as necessary, but generally at least once annually.

485 DM 22

MOTORBOAT OPERATOR INSTRUCTOR CERTIFICATION COURSE (MOICC) STANDARDS

1.1 **Course Description.** The MOICC is a course targeted toward experienced motorboat operators. It stresses the learning of specific motorboat handling techniques and knowledge through extensive hands-on practical exercises and instruction, with a minimum of classroom presentation. Since one objective of this course is to qualify individuals to present MOCC training to other Departmental personnel, there is additional training in instructional techniques and presentation.

1.2 **Course Objectives.** The MOICC objectives are to:

- A. Provide attendees with specific skills and knowledge needed to safely operate watercraft.
- B. Familiarize attendees with state-of-the-art watercraft safety equipment and other gear, through demonstration and actual use.
- C. Train and qualify personnel to serve as instructors of the MOCC.

1.3 **Course Length.** The MOICC will include at least 36 instructional hours. Course instructional hours may be increased to address specific bureau operational needs.

1.4 **Minimum Subject Areas.** The following mandatory subject areas will be presented in the MOICC:

- A. Bureau Watercraft Policies.
- B. Required Safety Equipment.
- C. Motorboats and Motorboat Maintenance.
- D. Trailers and Trailer Maintenance.
- E. Navigation Aids/Rules of the Road.
- F. Emergency Operations.
- G. Fire Suppression.
- H. Motorboat Orientation/Marlinspike.
- I. Motorboat At-Speed and Low-Speed Maneuvering.
- J. Alongside Maneuvering.

K. Trailing

L. Towing.

M. Instructional Techniques.

1.5 **Other Standards.** A maximum student/instructor ratio of 3:1 will be maintained.

485 DM 22

MOTORBOAT OPERATOR CERTIFICATION COURSE (MOCC) STANDARDS

2.1 **Course Description.** The MOCC is a course targeted toward individuals whose jobs require them to operate watercraft for the Department. It stresses the learning of specific motorboat handling techniques and knowledge through extensive hands-on practical exercises and instruction, with a minimum of classroom presentation.

2.2 **Course Objectives.** The MOCC objectives are to:

A. Provide attendees with specific skills and knowledge needed to safely operate watercraft.

B. Familiarize attendees with state-of-the-art watercraft safety equipment and other gear, through demonstration and actual use,

C. Allow attendees to demonstrate, through written examination and physical demonstration, that they have adequate grasp of motorboat handling techniques and knowledge to safely operate a motorboat.

2.3 **Course Length.** The MOCC will include at least 24 instructional hours. Course instructional hours may be increased to address specific bureau operational needs.

2.4 **Minimum Subject Areas.** The following mandatory subject areas will be presented in the MOCC:

A. Agency Watercraft Policies.

B. Required Safety Equipment.

C. Motorboats and Motorboat Maintenance.

D. Trailers and Trailer Maintenance.

E. Navigation Aids/Rules of the Road.

F. Emergency Operations.

G. Fire Suppression.

H. Motorboat Orientation/Marlinspike.

I. Motorboat At-Speed and Low-Speed Maneuvering.

J. Alongside Maneuvering.

K. Trailing

L. Towing.

2.5 Other Standards.

A. A maximum student/instructor ratio of 3:1 should be maintained to ensure that attendees obtain necessary operating techniques and knowledge,

B. MOCC instructors will have successfully completed the MOICC. Instructors will participate in MOCC presentations at least once over any three-year period to maintain proficiency.

485 DM 22

RETRO REFLECTIVE MATERIAL FOR PERSONAL FLOTATION DEVICES (REFERENCE 46 CFR 25.25-15)

“(a) Each life preserver, each marine buoyant device intended to be worn, and each buoyant vest carried on a vessel must have Type I retro reflective material that is approved under Subpart 164.018 of this chapter.

(b) Each item required to have retro reflective material must have at least 200 sq. cm. (31 sq. in.) of material attached to its front side, at least 200 sq. cm. of material on its back side, and, if the item is reversible, at least 200 sq. cm. of material on each of its reversible sides. The material attached on each side of the item must be divided equally between the upper quadrants of the side, and the material in each quadrant must be attached as closely as possible to the shoulder area of the item.”

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Replaces 11/20/95 #485A-4

DOI Departmental Manual, Part 485 (485 DM) Safety and Occupational Health Program Chapter 22; Watercraft Safety

Motorboat Operator Refresher Training (MOICC or MOCC)

1. **Course Description.** Refresher training is offered to currently certified motorboat operators and instructors. It provides updated information related to watercraft operation and helps ensure proficiency. The refresher training includes two modules: (1) A classroom element that assesses the operator's knowledge of safe boating, and (2) A proficiency element that assesses the operator's practical skills and abilities to operate a motorboat.

2. **Course Objectives.** The refresher training provides motorboat operators with updated information on new equipment, trends, and techniques in operating watercraft. Additionally, it provides a check of the operators skills, to ensure that individuals are able to safely operate motorboats in their expected work environment.

3. **Course Length.** A minimum of 8 hour (depending on educational option selected). Additional time may be included to address specific agency operational needs.
4. **Content.** The refresher training includes the review and update of the subject areas identified in 485 DM 22, Appendixes A and B.
5. **Options.** The student must complete an educational classroom module including an examination, and a practical proficiency module emphasizing demonstration of skills from the lists below:

a) Education (Classroom)

(1) Computer Internet course with a passing score of 70%. Proof of examination required. Acceptable Internet courses such as those found at the following addresses:

- <http://boatsafe.com/nauticalknowhow/boating/index.htm>, or
- <http://www.boatus.com/onlinecourse> or
- Other web course the student selects that is approved by their Bureau's National Watercraft Safety Lead.

The DOI Watercraft Safety Work Group (WSWG) will update other acceptable interact courses annually.

(2) Completion of the Power Squadron/USCG Auxiliary course with a passing score of 70%. Proof of examination required. See <http://www.cgaux.org/cgauxweb/public/pubframe.htm> for link to local courses. Also see <http://www.usps.org>.

(3) Completion of State Boating Safety Course with a passing score of 70%. Proof of examination required.

(4) Completion of an acceptable Video/CD-ROM course with a passing score of 70%. Proof of examination required. Student must identify which Video/CDROM course is to be taken prior to starting and receive approval from their Bureau's National Watercraft Safety Lead.

(5) Retaking and passing the DOI Motorboat Operator Certification Course (MOCC) with a 70% grade.

(6) Successful completion of the DOI Motorboat Operator Instruction Certification Course (MOICC).

b) Practical Proficiency

(1) Hands on demonstration of boating exercises in the presence of a DOI certified instructor. This should be selected if the employee operates boats occasionally as a normal part of their duties.

(2) Significant proven and safe operation of motorboats since completing the MOCC. This may be selected if the individual operates boats regularly as a routine part of their job.

(3) Retaking the Motorboat Operator Certification Course (MOCC). This should be selected if the individual has not operated boats on a regular or an occasional basis as a normal part of their job and needs to remain certified.

(4) Successful completion of the Motorboat Operator Instruction Certification Course (MOICC).

6. **Documentation.** Each bureau will utilize established procedures (i.e. SF-182) to maintain records of operator certification and a process to ensure certification is recorded and updated.

7, **Certification of Instruction.** DOI instructors will retain their certification by:

- . Instructing a MOCC or MOICC course at least every three years, or
- . Remaining active in the re-certification of their bureau's boat operators, or
- . Demonstrating to their bureau's boat/watercraft safety lead or safety manager, that they have safely operated boats on the-job over the past three years, and have kept abreast of changes affecting the boating program.

Instructors wishing to serve as a lead for MOCC courses must maintain their skills by participating in a MOCC/MOICC every three years. If the instructor has been inactive during a three-year period, they can conduct a MOCC with an active MOCC instructor and become re-certified to lead a MOCC.

An active instructor list will be maintained and updated annually by the DOI National Watercraft Safety Work Group.